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THE BRICKBVILDER

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THE BRICKBUILDER.

AN ILLUSTRATED MONTHLY DEVOTED TO THE ADVANCEMENT OF ARCHITECTURE IN MATERIALS OF CLAY.

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PUBLISHERS' STATEMENT.

No person, firm, or corporation, interested directly or indirectly in the production or sale of building materials of any sort, has any connections, editorial or proprietary, with this publication.

THE great strides which architecture in this country has made during the last twenty years, an improvement which has been increasingly rapid with every year that has passed, have been so often the subject of comment that the fact is frequently overlooked that there are many regions where the improvement has been but little felt. The advance has naturally taken place in the large cities, and the smaller towns have followed more or less in the rear. It is the condition of these smaller towns and outlying districts which we propose to consider, or rather which we earnestly urge our readers to consider with us.

The progress we have referred to has been, by no means, uniform, even in the large cities which have been the centres of this movement. It has not only had its ups and downs, its ebb and flow, but has been accompanied by an apparent retrogression. Fifty years ago in this country there were no buildings built which can compare with the best of to-day, neither were any built which sank as low as the worst that are done to-day. The work then was for the most part on the dead level of the commonplace. Its very commonplaceness saved it from further fall. In most cases its utilitarian baldness had, at any rate, a frank straightforwardness and directness, which gave it a certain matter-of-fact respectability. Since then the advance has been so rapid that public taste has not been able to keep pace with it, and often fails to distinguish between real merit and showy vulgarity. It has, we think, been a misfortune for our progress that much good work has been so showy. The public has supposed that the showy qualities were those which were of value, and, as the vulgar work was showy also, it has been thought to be equally meritorious. In this way partly (though other causes have contributed) the very advance has been productive of a parallel retrogression. The march of the really good architects has been accompanied by a host of vulgar and untrained men, who have imitated always the faults of their betters. The half-trained and ignorant "architect," or the builder who designs his own constructions, and who satisfies the craving for novelty of his customers by distorted copies of work he does not understand, has naturally secured his strongest foothold in the outlying districts and the smaller towns. The opportunities for training and for becoming familiar with the best work do not exist there, and the echo of the progress in the cities produces simply an unreasoning and untrained craving for novelty on the one hand, while on the other, in the face of such dire results, conservatism clings to traditional and vicious methods, the outcome often of the slipshod ways of the "boom," which has ushered so many of our newer cities into being.

IN no other field of architecture has progress been more marked of late than in brick building, and in no other province have the unfortunate conditions we have been referring to as characteristic of the less favored localities been so prominent. We do not refer to this condition of things hopelessly. Our readers know that we do not preach the gospel of despair, but we think it is time that the people in the outlying districts should be helped to appreciate the difference between good work and bad. Missionaries are wanted, and we believe that every brick manufacturing concern might be such a missionary, and a powerful one, and might find its profit in so doing. Let us take a concrete instance. In many small towns and cities the wooden or galvanized iron cornice is the almost inevitable crown to the store front. It is often a sham cornice at a considerable height above the roof, which it is supposed to finish. The wall it crowns is a mere screen; sometimes this screen is cut up into sham gables, executed in galvanized iron. Now if our brick manufacturers would exert themselves to point out the great superiority in point of durability, of beauty, of real architectural effect of a simply treated wall with grouped openings, crowned by a brick cornice, they would not only be making a market for their brick, introducing their use where galvanized iron or wood had prevailed before, but they would be accomplishing a work of real advantage to the community. They could render enormous service in helping to improve the aspect of our country towns. Some brick companies have done much by employing expert designers and offering designs for cornices, windows, doors, chimneys, and other details, and giving the price per foot, or per opening of a given size, at which the brick for these details can be furnished. In this way it can be shown to customers what very attractive designs can be produced by the use of the simplest means and at slight expense, and the flimsy sham cornices are driven out to make way for something better. This has been done in one or two instances. But every brick concern might operate in this way in its own district, and might thus improve the standard of work so far as its influence reaches, greatly to its own advantage. Unless carried out under the best advice, however, this plan will prove utterly futile. People soon tire of crude designs which they have chosen simply for their novelty, and will begin to look about for something else novel. The really good thing will always find a market and will always be in style.

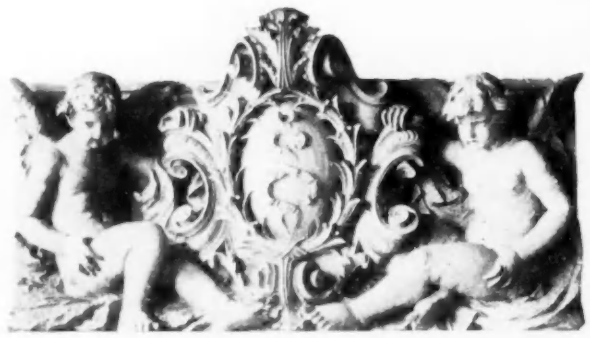
The publication by some brick companies of poor designs for architectural detail has done much harm, and in the long run has done those who promulgated them no good, while the good design is a permanently

paying investment, and brings credit and business to the company sending it out. If such a plan is adopted the important thing is, as we have said, to act under competent advice. We do not intend this as an idle suggestion, but shall be glad to co-operate in any way, or give our advice to any companies who may think of adopting it. We believe the plan will pay. Such a policy might usher in a reign of simple and appropriate and charming design in the less important and less expensive buildings of the country, which would lead to still further progress. It would do no injury to architects, quite the contrary. In the first place the aim would be to reach those who had not been in the habit of employing, or were not likely to employ, trained architects, and its tendency would be, by improving taste, to educate people to a proper appreciation of architectural training. Its ultimate effect would be to encourage the employment of thoroughly trained architects on all occasions.

OUR ILLUSTRATED ADVERTISEMENTS.

THE subject chosen for illustration this month, in the advertisement of the Hydraulic Press Brick Company (see page xxi), is a view of the entrance to the upper church of St. Francis at Assisi, also the flight of steps leading to the square on which this entrance opens down to the lower square, which is on a level with the lower church. The small bell turret and the adjoining arcade were added in the time of the early Renaissance.

We were unable to procure in season for publication in last month's edition a photograph of the Wolfe Building, New York, H. J. Hardenberg, architect. Mr. John Beverly Robinson, in his



article on "Recent Brick and Terra-Cotta Work in New York City" (April number), says of this building, "I think it may be considered, whether we admire it or not, the most noteworthy attempt at a design that can be found among the new steel frame buildings anywhere. An effort has been made, and I think successfully, at making a very tall building a real pleasing thing to look at."

A half-tone illustration of this building may be found in the advertisement of the New York Architectural Terra-Cotta Company (see page xx), who furnished the terra-cotta. The accompanying illustration is of a bit of detail used in the façade.

BEGINNING with this month, we shall hereafter print our plate pages on coated paper, and on one side only. These pages will be inserted loose into the journal, and there will be as a rule but six of them, although the number may be increased on special occasions.

We have every confidence that this change will meet with the approval of our subscribers, and that they will accept the reduction in the number of plates in lieu of the more desirable manner in which they will be published.

Our patrons may depend upon it that THE BRICKBUILDER will be improved month by month, and year by year, as we are able to consistently do so, as we have an ambition to make THE BRICKBUILDER eminently worthy of the materials and industries it represents.

BRICKBUILDER COMPETITIONS.

PROGRAM.

WE desire to announce a competition open to all draughtsmen who are subscribers to THE BRICKBUILDER, for a city house of brick. The house is to have a frontage of twenty-five feet on the street. The lot is eighty feet deep. The house will have four stories over the basement, and its cost must not exceed $16,000. The front will be of brick, with architectural detail of moulded pressed brick, taken from the catalogues of our advertisers, or of pressed brick and terra-cotta; colored faience may be introduced into the ornamentation if desired. The drawings will be made in line with black ink, on two sheets, cut to the uniform size of 14″ x 18″. One sheet will show the elevation at a scale of one fourth inch to the foot; the other, the plans of the first and second floors, at a scale of one eighth inch to the foot; and details of the façade (especially the cornice) at a scale of one half inch to the foot. The style of brick bond adopted must be clearly shown on the elevation. Drawings must be received at the office of THE BRICKBUILDER not later than the first day of June. THE BRICKBUILDER offers a first prize of $60, a second prize of $40, and a third prize of $20. In addition to these prizes, THE BRICKBUILDER offers a special prize of $40 for that design, *accompanied by specifications*, for a similar brick house, of fireproof construction throughout, which can be executed at the lowest cost. In awarding this special prize, only those designs will be admitted to competition which reach a certain standard of excellence in design; but beyond that, the awarding of the prize will depend on the excellence and the economy of the construction called for in the specifications. Designs unaccompanied by specifications will be regarded as being entered only for competition for the first three prizes. This special prize may be taken by one of the winners of the other prizes, or by another, as the case may be. The question of cost will be submitted to an expert builder. The prizes will be awarded by a jury of three architects of acknowledged reputation.

Each drawing must be marked with a motto or cipher, and a sealed envelope similarly marked, containing the full name and address of the designer, must accompany the drawings. These envelopes will not be opened until after the award is made.

THE BRICKBUILDER reserves the right to publish the prize designs and the prize specification. Other drawings may be published with the permission of their authors. At the conclusion of the competition all drawings will be returned to competitors. Drawings must be delivered flat, express or postage prepaid.

WE would remind those who are intending to submit designs in the competition, the programme of which is announced on this page, that it will be necessary to have all drawings reach us not later than June 1.

WE have several more competitions in contemplation, which will be of a very interesting character, and open to all subscribers to THE BRICKBUILDER. The first of these will be announced upon the completion of the competition now being held.

NEW ADVERTISEMENTS.

ON page xiv may be found the new advertisement of the Fawcett Ventilated Fireproof Building Company of Philadelphia. A full page is used in illustrating and describing their system of construction.

Another new advertisement is that of the National Brick Company of Bradford, Pa. (see page xii), for whom Charles E. Willard, 171 Devonshire Street, Boston, is New England agent. This company makes their brick from pure shale and without the use of coloring matter of any kind.

Still another new-comer with us is D. J. Curtis of Springfield, Mass. (see page xii). Mr. Curtis is one of the best known brick manufacturers in New England. The lines that he specially advertises are circular brick for power chimneys and ornamental brick moulded in sand and not re-pressed.

BRICK AND MARBLE IN THE MIDDLE AGES.

G. EDMUND STREET.

CHAPTER VIII. — *Continued.*

THE internal effect of the church is much finer than its west front would lead one to expect. The plan is simple, — a nave and aisles of six bays, transepts with three eastern chapels to each, and a choir of one bay with an apse of four bays projecting beyond the others. The tower is in the angle between the north transept and the nave, and a large sacristy with an eastern apse is built against the south transept. The nave and aisles measure about 230 feet by 104, and the transept 160 feet by 48, — magnificent dimensions undoubtedly. The columns are simple, cylindrical, and very lofty, their capitals carved with foliage, which looks late and poor in its execution, though grouped in the old way in regular tufts or balls of foliage. The arrangement of the wall above the main arcade is very similar to that of the Veronese, and, indeed, to that of most Italian Gothic churches; a plain wall being carried up to the groining, relieved only by a small clerestory window at the highest point. One is apt to compare this arrangement with the artistic arrangement of clerestory and triforium in our own churches; but herein we do not act quite fairly to Nicola Pisano, who is said to have designed the Frari, and his brethren. They had to work in a country where light must be admitted very sparingly, and where, therefore, it is impossible for architects to revel in the rich traceries which fill the bays of the churches of the North; they lived among a nation of painters, and deemed, perhaps, that these plain surfaces of wall would one day glow with color and with Scripture story. For these reasons, then, I defend them for the bareness and over-great plainness which are certainly at first felt to be so remarkable in their work. The real beauty of these interiors is owing, more than to anything else, I believe, to the simplicity and purity of the quadripartite groining which covers them in, and which, even where other features would seem to tell of debasement and absence of pure feeling, invariably recalls us to a proper recollection of the infinite value of simplicity in this important feature, — a point lost sight of in England after the thirteenth century, to the incalculable detriment of the beauty of some of our greatest churches. It is not difficult to prove that this must be the case, for I take it for granted that we all feel that ornament for its own sake is valueless; and equally, that doing in a troublesome, and therefore costly, way that which may be done as well and as strongly in a simpler manner, is unpleasant and distasteful as an exhibition of the wasteful expenditure of human skill and energy, and therefore as simple quadripartite groining with diagonal and transverse ribs, and no lierne or intermediate ribs, is quite sufficient for the construction, and as the vaults are in no degree whatever strengthened by the multiplication and ramification of perplexing ribs, such as we see in later days in fan tracery and other contemporary modes of vaulting, that it is the truest and most agreeable system of roofing in stone.

The simple groining of the Frari is entirely executed in brick, and springs in the aisles from pilasters corbelled out of the walls midway in height, just as in Sta. Anastasia at Verona, and in the nave and choir from clusters of shafts rising from the caps of the columns.

The apse is the noblest feature of the whole church; its windows, with their singular and not quite pleasing transom of tracery, are refreshing because they have tracery, though indeed it is of a rude and heavy kind.

There is something impressive about the arrangement of the church. The choir is prolonged by the length of about one bay and a half into the nave, and fenced off to the west by a great screen, surmounted by figures of the apostles, with a crucifix resting in the centre. The nave is, of course, quite free from any fixed seats, and this, with the great area of the transept and the fine perspective of the long range of seven apsidal chapels on its east side, gives a grand air of spaciousness to the whole interior. There are some fine monuments here, quite worth notice as very characteristic of Italian art. They are generally high tombs corbelled out from the walls, with arched canopies over them, enclosing paintings. Here the south transept wall over the door to the vestry contains a group of such monuments, which is extremely picturesque. The monument of "Beatus Pacificus" (A. D. 1437) has a graceful painting of the Annunciation over its arch, and sculptures under it of the Baptism, and, on the tomb, of the Resurrection and the Descent into Hell.[1] Another monument has a life-size figure on horseback, and all have so much freshness to an English eye, and yet so much identity in principle with our own old monuments, that they are well worthy of study. Last, but not least, are two immense monuments facing each other, near the west end of the nave, to Canova and Titian, preposterous in size, heavy, ugly, and cold in character, quite unsuitable to a church, and, so far at least as I could judge, entirely devoid of merit as works of religious art. There is, too, a painting by Giovanni Bellini of the Madonna and Saints, which ought to be visited, in the grand and well-used sacristy, — a room such as one never seems to see save in Italy. It is still in its old frame over the sacristy altar. Both in artistic interest and in religious effect it is perfectly fine; the subject — a Madonna and Child, such as Gian Bellini alone could paint. Angels playing instruments, sweet and pretty in character, and saints full of reverence and awe for our Lord, all treated with a color of exquisite depth and richness throughout, make this as worshipful a picture as I know. There is also in the north transept a most elaborately framed Gothic triptych, with figures well drawn and rich in color.

The stalls in the Frari are all placed in the nave west of the transept, as in Westminster Abbey. They are of very rich Renaissance character, but with some late Gothic features. In the north transept is some elaborate Gothic panelling — very German in character — which looks as if it had come from the back of the old choir stalls. Here, too, is a crucifix, probably the original rood. Some fragments of stained glass are still visible; they are coarse and rude in detail, but extremely fine in color, and one must picture the church full of rich glass in order to do justice to the scheme of the mediæval architect.

To the south of the nave are large uninteresting cloisters, and it is only at the east end that the exterior at all repays the ecclesiologist for the pains he must take to get all round it. The view which I give will best illustrate its general character. The windows are all transomed, the tracery and portions of the arches being executed in stone, the rest of the wall being entirely of brick or terra-cotta with some red marble in the eaves arcading; the bricks are not particularly good, and the terra-cotta borders, cornices, and ornaments are poor and meagre in their design. The most observable point about the detail is the great and ugly splay on the exterior of the windows, and the facts that the window mouldings are returned round the sills, and that all the apsidal terminations in the church finish with an angle in the centre, — a peculiarity which is very seldom met with, but very much to be commended as variety.

There is a degree of clumsiness about the way in which the arches of the windows are set upon the jambs which is very characteristic of Italian Gothic; but this, and other points open to criticism, do not prevent the east end of this church from being a very noble conception, broad and grand, unbroken with the lines of buttresses, which generally too much confuse apsidal terminations, and yet very vertical in its effect. There is no petty attempt at relieving or ornamenting plain wall where it occurs, but it is left in the native rudeness of the rather rough-looking red brick, which is in no respect better than the bricks one may get anywhere in England. The cornices are very marked, and those in the clerestory have the common and ungraceful corbelled arcading in brick, to which I have a special antipathy. The clerestory windows of the transepts and choir are, I need hardly

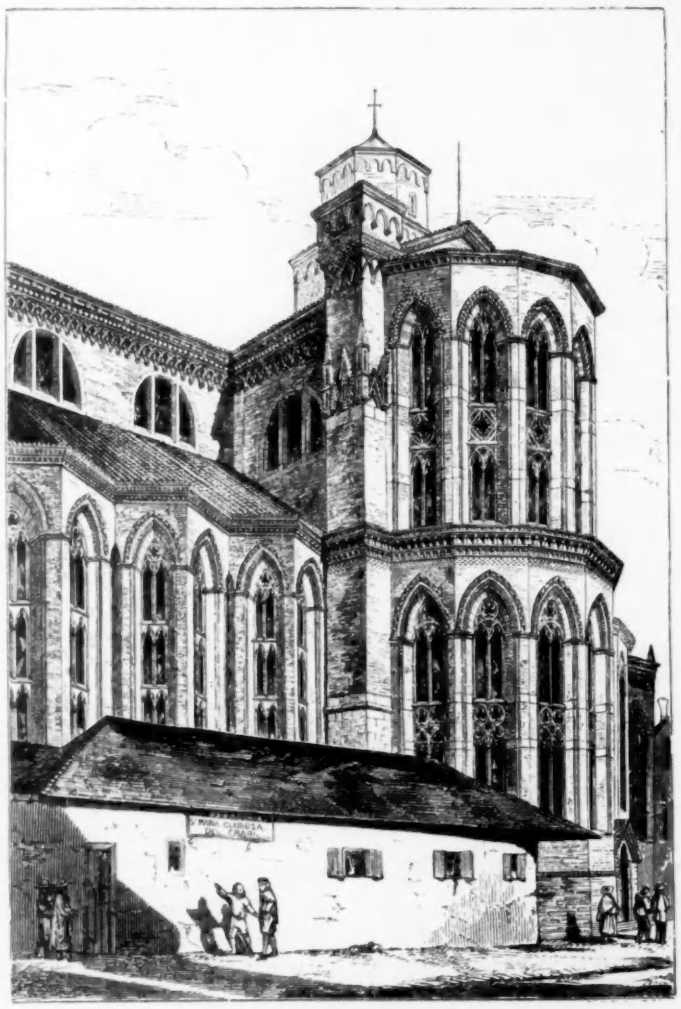
[1] The crockets on the monument of A. D. 1437 are exactly similar to those on the western gables of St. Mark's, and prove that these are of about the same date.

say, quite modern, and of a kind unfortunately most popular throughout the North of Italy. North of the choir is a tall brick campanile, leaning rather dangerously to the north, finished with an octagonal upper stage, and, though not very remarkable, making a conspicuous feature in most of the views of this part of Venice, and at any rate to be admired for its simplicity and the absence of effort in its design.

Next in order of merit to this church are those of SS. Giovanni e Paolo and of the Madonna dell' Orto, both of them savoring most strongly of the influence of the Pisani, and in very many points remarkably like the church of the Frari.

We will take SS. Giovanni e Paolo first. The plan is of the same sort as that of the Frari, — nave with aisles, and transepts with two chapels opening on each side of them. These are all apsidal, but planned in the usual way and not as at the Frari. The east end is a fine composition, having an apse of seven sides, and is the only part of the exterior to which much praise can be given. It is divided into two stages by an elaborate brick cornice and a good balustraded passage in front of the upper windows. The traceries are all unskilfully designed, and set back from the face of the wall with a bald plain splay of brickwork around them; the lower windows here have two transoms, and the upper a single band of heavy tracery which performs the part of a transom in an ungainly fashion, though not so badly as in the great south transept window in the same church. Here, just as at the Frari, it is obvious that the absence of buttresses to these many-sided apses is the secret of the largeness and breadth which mark them; and, to say the truth, not only are large buttresses to an apse often detrimental to its effect, but at the same time they are very often not wanted for strength. The interior is remarkable on account of the fine scale on which it is built, and for the large number of interesting monuments corbelled out from its walls. Many of them are mediæval and rich in sculpture of figures, not only on the tombs themselves, but again in the face of the wall, around their canopies. The effigy of the deceased is almost always placed on the top of the high tomb or sarcophagus, which, in order that it may be visible from below, is made with a slope towards the spectator, the effect of which is most distressing. Much more beautiful generally is the curtained tester often put above the figure, on either side of which guardian angels, holding back the folds of the draperies, allow us to join them in looking at the figure on the tomb. There is here a very fine lectern — a double-headed eagle standing on a scorpion — with a rich mediæval stand and base.

There are small two-light windows just over the arches in the nave which take the place of a triforium, and which look almost as if they were the clerestory windows of an earlier church whose arches were much less lofty than those which now exist.



STA. MARIA GLORIOSA DEI FRARI, VENICE.

In the small piazza in front of the church stands one of the glories of Venice, — the monument of Bartolomeo Colleoni. As is the case with too many equestrian statues, the base seems dangerously small for the steed, slow and stately as his movement is. What a grand air of valiant determination this old warrior wears! what a serious purpose the artist had in his work, and how carefully he has rendered every detail of trapping and armor on both man and horse! We have already heard of this famous *condottiere* in his chapel at Bergamo and his castle of Malpaga. His statue was the work of Andrea Verocchio, but was completed by Alessandro Leopardi, between 1479 and 1488. Colleoni had left his whole fortune to the republic of Venice on condition that his statue should be placed in the Piazza of St. Mark. This being contrary to the laws, an ingenious loophole for escape was discovered: the bequest was secured by the erection of the statue in front of the Scuola di San Marco, whose strange Renaissance front (built with colored marble in a horrible sort of perspective, which is the lowest depth to which architecture ever reached) stands at right angles to the front of SS. Giovanni e Paolo. For any one who wished to be remembered near St. Mark's church, the catastrophe would be as great, if he cared about art, to find himself connected instead, with such an abortion as the Scuola of that ilk, as it would be to Bartolomeo Colleoni to find himself here in the suburbs when he stipulated so carefully for a place in the very centre of the city!

(*To be continued.*)

GLAZED BRICK.

BECAUSE a glaze is a good glaze on certain classes of clay goods, it by no means follows that it is equally serviceable on other clays. Indeed, it is extremely unlikely. We have never met with a glaze so accommodating as this yet. What is the reason? Simply this. Different substances contract and expand at different rates when exposed to various degrees of temperature. The difference between the expansion of a given bulk of iron at 500° C. and a similar bulk of copper at the same temperature is very marked. It is the same for other materials, and is especially remarkable in connection with clays.

Clay A expands or contracts in kiln at a certain given rate; clay B exceeds that rate; therefore if a glaze suits clay A, it certainly will not suit clay B: for glazes expand and contract as well as clays, and if a glaze suits a clay it is because this physical quality of expanding and contracting is possessed by the glaze to the same extent as it is by the clay.

If glaze and clay contract or expand unequally, the former will crack and may even chip off. The proper thing to do, therefore, is to study the composition of the glaze and also of the clay, and endeavor, by altering that of the glaze (one cannot easily alter that of the clay), to bring its contraction and expansion into harmony with that of the clay. — *British Clayworker.*

THE ART OF BUILDING AMONG THE ROMANS.

Translated from the French of Auguste Choisy by Arthur J. Dillon.

CHAPTER II. — *Concluded.*

SPECIAL CASES IN THE CONSTRUCTION ON VAULTS; MEANS OF STRENGTHENING; BUTTRESSES, ETC.

THE walls of the Pantheon form a continuous drum about the edifice, and are lightened by two stories of interior cells, whose arrangement I have endeavored to show by drawing them partially denuded of the revetment that closed and concealed them. Between these spaces for lightening the wall other cells were built in the form of vaulted niches, with their convex surfaces turned in the direction from which the thrusts would come. Barrel vaults, or half-cylinders vaulted by quarter-spheres, such were the usual forms of the cells which the Romans built in the midst of the walls that received thrusts: we shall see them in the piers of vaults and find them again in retaining walls (Plate XIV., Fig. 1). Everywhere their *rôle* is the same: they increase the total thickness or bearing and add to the stability, without increasing the expense to any noticeable degree.

At the same time that the Romans sought to maintain their vaults by great masses of masonry, they also sought to render the thrusts less dangerous by using in their construction materials of very little weight. The use of lava in ancient vaults was very usual; and the large number of instances of its use at those points where lightness was so desirable a quality prohibits us from regarding its presence as accidental. The greater part of the vaults of the Coliseum, and those of the Baths of Titus and of Caracalla, are built of volcanic tufa that is very porous, and all compact or heavy stone is carefully excluded; and a note, in the compilation of Isidore of Seville, very probably taken from some Roman writer, plainly shows that the custom was to reserve the lightest materials for the construction of vaults.[1]

There is one matter of detail often connected with this idea of lightening the vaults whose importance is, in our estimation, exaggerated. It is the presence of vases of clay in the rubble.

The small space, compared with the total volume of the vaults, which these vases occupy, and especially the places where they are found, tend to make us believe that their use was not because of their lightness. In fact, if the ancients had thought that the placing of the vases in the midst of the vaults was a means of lessening the thrusts, we would find them near the summits, that is, where weight was most to be avoided. This is the contrary to what really exists in the greater number of cases. The positions of the vases can be observed in a monument of the fourth century, which, on account of their presence, is called the Torre pignattara. Vases of terra-cotta can also be seen buried in the vault of Minerva Medica (Plate XI.), and I was also able to study the position of these vases in a number of tombs along the Via Labicania, and more especially in the Circus of Maxentius, outside the gate of St. Sebastian; everywhere I found them gathered near the flanks of the vaults. Plate IV., Fig. 1, shows how they were used in the last-mentioned case. Sometimes they are over the vault itself, but more ordinarily they lie directly over the solid walls that form the piers, and are most numerous at just those points where their lightness was of no advantage. I have even found them in the body of the walls. To give one example out of many, if one examines the façade of Minerva Medica he can see, on the right, a little above the archivolt of the door, one of these vases buried in the rubble wall, just behind the exterior revetment. In a word, the distribution of these vases is such that any theory that their use was due to calculations based on the advantages arising from their lightness is out of the question.[2]

The origin of their use was probably this: liquids were constantly being brought to Rome, for the alimentation of its inhabitants, in vases of baked clay. The Romans had nothing to export in them in exchange, and consequently had on their hands a large number of old vases of large size and of small value. They got rid of them, it is thought, by throwing them, as being useless, in the place that to-day bears the name of Monte Testaccio; the fact is at least that the hill thus called is formed entirely of *débris* of Roman pottery. It must have occurred to the builders to utilize these vases as building material; they were as good as stones of good quality, and, in equal volume, certainly were not more expensive than the broken stone for which they were substituted. On account of their lightness they were placed, in preference to ordinary stones, in the upper parts of the buildings, being easier to lift; but the idea of using them to reduce the weight and hence the thrusts of the vaults does not seem to have occurred to the Romans. We find this idea put into practice in the Lombard buildings at Ravenna and Milan. I do not know whether the Lombard architects invented the vaults without thrusts which they obtained by means of the vases, but it appears at least very probable that they did not borrow the idea from the Romans. It seems more likely that the methods used in the dome of St. Vitalli were brought into Italy by the same route as the architecture of the edifice; and under this hypothesis the honor of the first logical application of pottery in the building of vaults belongs entirely to the architects of the Byzantine school.[3]

Moreover, if one considers only truly Roman buildings, the use of hollow vessels is but a secondary detail of their history, and an investigation of the ancient uses of this form of baked clay in construction gives no important conclusions nor reveals any facts capable of completing or of showing more plainly the principles developed in the course of this study.

One of the last figures (Fig. 54), a Roman hall seen from the exterior, shows a remarkable peculiarity of the ancient vaults. It is that the vaults themselves form the roof of the edifices they cover; one never finds the vaults covered with a wooden framing or gable. It seemed to the Roman builders that to protect a vault of masonry with a roof of wood, a costly, unsubstantial material of short duration, was a useless combination, and that it was to do work for the same end twice over; either they used roofs of wood, without vaults, or they used a system of vaulted construction, in which case wooden roofs were excluded, and the vault alone served all purposes; on its extrados were placed the plates of metal or the tiles that shed the rain; and sometimes the masonry, levelled like a terrace, has no other protection than a bed of fine compact *béton* (Fig. 57).

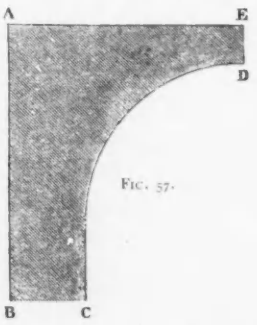


Fig. 57.

[1] "Sfungia, lapis creatus ex aqua, levis ac fistulosus et cameris aptus." Orgin., lib. XIX., cap. x.

[2] One might perhaps think, when seeing this pottery used in ancient buildings, of those vases of clay which, according to Vitruvius, were used, together with metallic vases, to make halls used for large assemblies more sonorous; but the similarity is, I think, quite accidental. The desire of increasing the effect of the voice can be understood in the case of theatres and such buildings; but in the tombs, such as the Torre pignattara, or in those along the Via Praeneste, this quality of sonority evidently has no place. Moreover, Vitruvius does not say that the acoustic vases were built into the walls of the theatres; they were only placed under the seats; so that from no point of view does an analogy between the two kinds of vases seem admissible.

[3] See for the description of vaults built of hollow tubes laid in mortar the work of M. de Dartein on Lombard architecture. M. de Dartein, who kindly allowed me to use the results of his researches, in order to assist me in clearing up the origin of vaults built of clay vessels, believes that the use of this system of construction goes back to at least the fourth century; and has verified his view not only in St. Vitalle at Ravenna, but also in the Baptistery of Ravenna, restored and decorated by St. Neon (425-430), and in the ancient chapel of St. Satyre, near the church of St. Ambrose, in Milan.

A whole series of vaults in the Baths of Caracalla belongs to this type; they terminate in an almost horizontal surface, and the last course of masonry, covered with a mosaic of colored marble, forms the floor of a magnificent terrace.

In the other case, where the vault is covered with tiles of metal, it ordinarily has the form of a gable roof. There is a remarkable instance of this in the church of St. Maria Maggiore (Fig. 54). The interior is a series of intersecting vaults; and if one will imagine each as being covered with its own roof, he will obtain the exact idea of the shape of the exterior, the valleys corresponding to the groins. Of all possible solutions this is the most natural and the one that gives the best flow for the rain water. Similar solutions can be seen in the Baths of Paris, in the Basilica of Constantine, etc., differing only in that the spherical vaults are finished on the exterior with convex surfaces, as in Fig. 58. This exception is justified by the fact that in order to obtain a plane surface it would be necessary to use additional masonry amounting to an increase of considerably more than half. The Romans thought this out of proportion to the results, and it was one of their most marked traits that they knew where to stop when following out a series of ideas or principles, whose resulting practical rules would lead to extremes if rigidly observed.

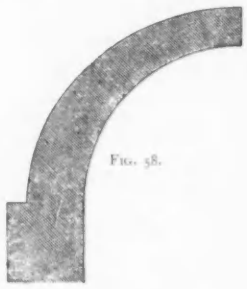


Fig. 58.

The last question, of how the vaults were maintained, remains to be taken up, together with the questions of what brought about the ruin of those that have fallen and of what means were used to repair, or to prevent the complete destruction of, those that were partially ruined during the time of the Romans.

Among the causes of rupture to which vaults of concrete were exposed we must first mention the sudden movements or unequal settling of the soil. Then comes a cause that seems very insignificant, but one which the ancients considered quite serious, the destructive action of the roots of large vegetable parasites, growing in the insterstices of the masonry. From all time the Roman laws sought to prevent this danger by fixing the distance at which plantations could be placed from aqueducts, which were the works where fissures were most to be dreaded. As soon as the year 11 before our era, a decision of the Roman Senate prohibited planting within fifteen feet of aqueducts; this prohibition has been transmitted to us in the treatise of Frontinus on aqueducts, and three centuries later we see it confirmed and emphasized in the Constitutions of Constantine.[1]

The danger that they sought to prevent was really serious; one can hardly imagine what great masses can be moved by roots in the course of time, and it would not be far wrong to estimate the ruin brought about by this obscure cause as equal to that due to man.

Whatever may have been the cause of its rupture, a Roman vault was repaired by lining it with an inner vault of brick, laid with radiating joints. In the environs of Rome there are several instances where aqueducts have thus been repaired by inner vaults that made up for the inability of the original armatures to carry the masses of rubble; the second figure of Plate XIV. shows one of these aqueducts strengthened after building; the arcade in which I found the facts for this drawing is one of those near the platform of the Lateran; its ruins are almost immediately behind the chapel of Scala Santa.

The method was as simple as it was ingenious. The vault intended to support the ruptured one was built without endeavoring to consolidate it with the first one; on the contrary, a space was left between the ruptured vault and the strengthening one, walled up at one end, so that there was left a sort of cylindrical chamber which was afterwards filled with well-rammed *béton*, that formed a bed between them.

[1] Frontin, De aquaed., n. 126 and 127. Cod. Theod., lib. XV., tit. II., l. 1. Cf. Cassiod., Variarum, lib. II., ep. 39; lib. V., ep. 38; lib. VII., form. 6. Compare these remarks of the ancients with those that L. B. Alberti gives in the sixteenth chapter of the tenth book of his work "De re aedificatoria."

Such was the method; sometimes it was simplified by building the strengthening vault without placing a bed of mortar between it and the ruptured one. It was thus, I judge, that several of the monuments of Pompeii, damaged by disturbances before the great eruption, were repaired; the Baths and the Ampitheatre were perhaps among these. And I will also cite an ancient vault, known only through an inscription, which was, according to it, "propped up by supporting arches" of double thickness and carried on special piers. (Orelli, no. 3328.)[2]

The arches in Pompeii might strictly be given another function, but the document I have just given makes it useless to enter into a discussion whose result would be doubtful at the best; for though there may be some question of the arches in Pompeii, it is at least certain that exactly similar ones were used by the ancients to prevent the fall of ruptured vaults.

(*To be continued.*)

We would like to arrange with a draughtsman in each of the following cities to furnish us with a monthly letter which shall be a review of the important building being done or contemplated in their respective cities: New York, Brooklyn, Buffalo, Cincinnati, Pittsburgh, Indianapolis, and St. Louis. Address, The Brickbuilder Publishing Company, Boston.

THE CONKLING-ARMSTRONG COMPANY, Philadelphia, have secured the contract for terra-cotta on the Horticultural Hall in that city, Frank Miles Day, architect. Pompeian terra-cotta will be used.

THE new catalogue which The Conkling-Armstrong Company are about to issue will be quite an elaborate affair, being so constructed that additions may be made to it from time to time of photos of such work as the company may produce.

THE large contract for furnishing the enamelled brick to be used in the construction of the new Guaranty Building, Buffalo, N. Y., has been awarded to the Tiffany Pressed Brick Company of Chicago.

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[2] These are the words of the inscription: "Albinus . . . cellam tepidarium inclinato omni pariete labent, de qua cellarum ruina pendebat erectorum a fundamentis arcum duplici munitione fulcivit."

ON THE USE OF BRICK IN DOMESTIC ARCHITECTURE.

II.

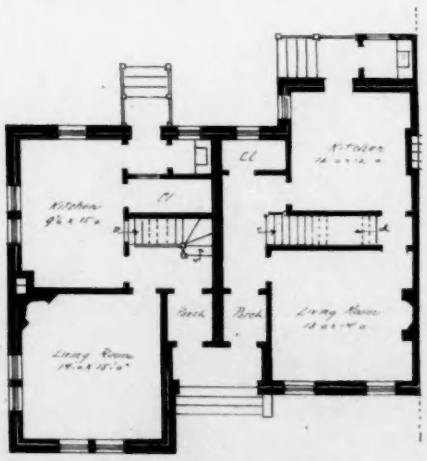
BY RALPH ADAMS CRAM.

WORKMEN'S COTTAGES IN CITIES.

IN a former article I attempted to make some suggestions towards a reform in the humblest class of domestic building, viz., in workmen's cottages to be built in small villages; in this paper I wish to consider the same class of work in cities.

All that I said before in the matter of the false economy, artistic degradation, instability and moral injury of the ordinary wooden tenement or cottage holds in the case of city work of a similar nature. To be sure, the restrictions which surround city blocks prevent such a degree of artistic horror as obtains in country work, but if the æsthetic depravity is less aggressive, it is just as destructive in its passive aspect, and so the ordinary blocks of barren face brick, disintegrating brownstone, and crazy galvanized iron are just as immoral, just as mentally injurious to the unfortunate occupants, as the more ambitious and therefore more aggressive wooden absurdities that desecrate our modern villages and city suburbs.

Now this condition of things is unnecessary. Blocks of small houses can be built well, and with some element of beauty, for the same amount of money that is wasted on face brick horrors with galvanized iron bay-windows; all that is necessary is a little intelligence in the matter of economical planning, a little regard for beauty, and some slight knowledge of how to spend money for ornamentation that will ornament. You can't make a brick wall with holes in it beautiful by putting a crazy galvanized iron bay-window on it, and crowning it with a false gable of the same disgraceful material; neither can you add to its attractiveness by sticking a few pieces of quarry-faced brownstone into it, varying its red monotony with scrofulous "Roman brick," and rendering it a public nuisance by filling its front door and its transoms with crude blue, orange, and magenta glass. Thus far goes the resourcefulness of the ordinary builder, and no farther, and the immoral results we have with us always.



Plan of First Story.

What is the alternative? What can we do to make a block of cottages no less expensive, though more honest in construction and more artistic in effect?

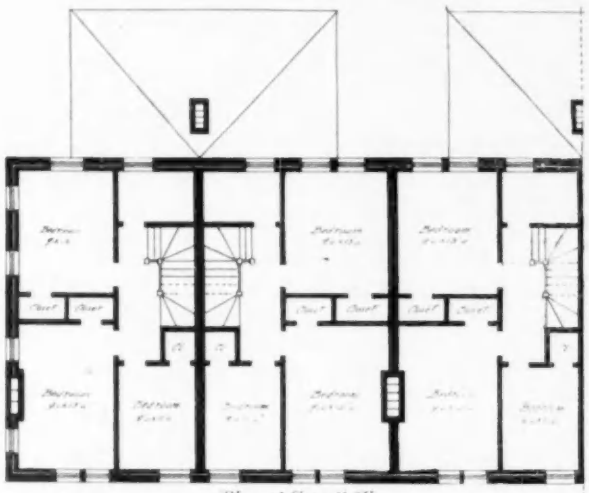
First of all we can provide economical plans. The actual area of the houses illustrating this article is about eight hundred square feet each. They are twenty feet wide, and would go on lots from forty feet to fifty feet deep, each having a small back yard, the grass plot in front varying with the depth of the lot. One of the blocks, that of four houses, would be but two stories high with an unfinished cellar, the other three stories high. The two-story cottages would contain a living-room, dining-room, and kitchen, and four bedrooms, with an unfinished laundry in the basement. The three-story cottages would contain six bedrooms and a bath, instead of the four of the two-story plan. From eighty to one hundred houses of this nature could be built on an ordinary city lot of two hundred and fifty by five hundred feet, the number depending on the amount of land reserved for a park in the centre of the block, in place of the useless and generally unsightly grass plots in front. The cost of such structures would be exceedingly small.

Plan of Second Floor

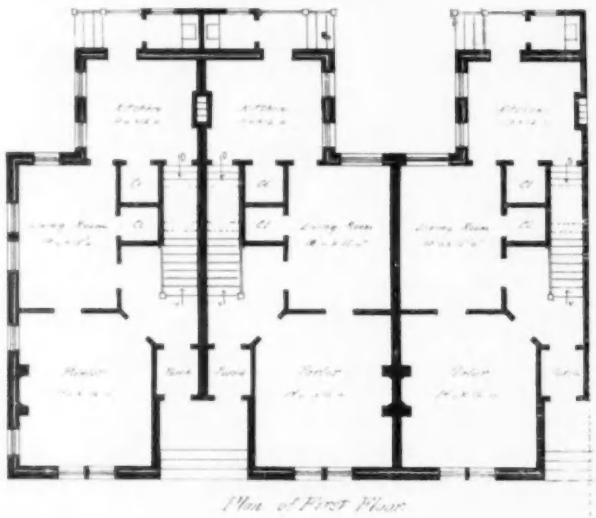
The external treatment should be of the simplest nature, the effect of the houses depending on their proportions and delicacy of such detail as they might have, — a principle now apparently entirely

forgotten, but which should hold in more ambitious work as well. The plans shown for four-house blocks have the simplest possible colonial exterior, the effect being obtained by recessing the two middle houses, by the range of plain elliptical windows, and by the brick pilasters breaking up the recessed portion. The material used is common red brick laid in English bond with white mortar; the sills are plain slip sills of Vermont white marble; while the cornices, pilaster caps, and window details are of wood, painted ivory white. The roofs are covered with copper, and the steps are of Vermont marble. Inside, the finish is plain, natural wood, cypress or Washington cedar and whitewood, no *papier-maché* or colored glass being allowed. The floors and stair treads are of rift hard pine. Above the first story mill doors and windows are used.

In the exterior of the six-house plan the same common red brick is used, laid in Flemish bond, the trimmings being of gray terra-cotta.



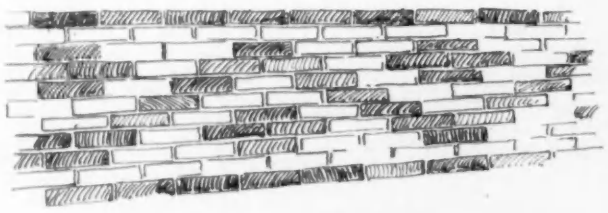
Plan of Second Floor



Plan of First Floor

The interior treatment is similar to that of the other design, except that black cypress, finished natural, or Canadian elm, stained dark brown, is used in the hall and living-room, an oak floor being provided in these two rooms.

It is a question whether houses such as these would appeal to the class for whom they would be provided, owing to their extreme simplicity of design, the malignant influence of the ordinary tawdry block having been dominant for so very long. I think they would, particularly if they were built as they should be, solidly and honestly. I doubt if all the unfortunates who accept the building abominations really like them; they take them because there is nothing better.



A SIMPLE BRICK DIAPER.

MESSRS. FISKE, HOMES & CO. make a most elaborate display in their Boston office of the effects that may be obtained by the use of the various colored brick in diaper patterns and frieze work.

TERRA-COTTA OR STONE?

BY THOMAS CUSACK.

IN the first instalment of Mr. Beverley Robinson's appreciative review of "recent brick and terra-cotta in New York City," attention is very properly directed to the Wolfe Building at the junction of Maiden Lane, William and Liberty Streets. Here the architect, making virtue out of a necessity, has created a picturesque structure of a dozen stories on a site as cramped and awkward as any on Manhattan Island. True, Mr. Hardenbergh is not a man accustomed to succumb to circumstances, but on this trapezium he had an unusually obdurate and intractable subject to subdue. His acceptable solution of the problem has been attested by fellow-architects, and their favorable comments will be confirmed by most people who are able to understand the difficulties with which he had to contend.

Mr. Robinson's detailed criticisms bear evidence of thought and deliberation, presumably in front of the actual building as it now stands. This much is obvious from a reading of his article. Yet he came away under the impression that the whole of it was "red brick with light colored stone trimmings," and regretting, as well he might, that "the adornments were not of terra-cotta." He will be pleased to know that there is no occasion for regret on this point, and to that end I hasten to assure him that more than nine out of the "*twelve stories with a great abundance of stone trimmings throughout, quoins, voussoirs, beltcourses, colonnettes, copings towering upwards, with crowstepped gables and dormers, balconies and bays, all most skilfully and logically worked out*," are indeed terra-cotta. Had this not been so, then there would have been one more added to the long list of similarly neglected opportunities. Mr. Robinson may extract some comfort from the further thought that he is by no means the first or only man who has been, and who will be, led to a wrong conclusion by cursory observation of the terra-cotta on this and many other downtown office buildings of note, to say nothing of some uptown residences to which I may have an opportunity of referring him.

A few weeks ago the present writer, accompanied by a candid but hypercritical friend, made an inspection of this very building, affording as it does a good average specimen of terra-cotta work in the year 1895. The gentleman in question had, in early life, been an expert foreman stonecutter, but during the past twenty years has been the moving spirit in two of the chief terra-cotta works in England. He at first hesitated to believe that the work on the Wolfe Building was terra-cotta at all, and finally failed to draw the line of demarcation between it and the two first stories, which *are* of stone. This from a practical prosaic Briton, with all the prepossessions of his countrymen thick upon him, might be thought praise indeed. But the fact that terra-cotta can be made undistinguishable from stone is *not* its chief recommendation, as I will endeavor to show presently. At the corner of Nassau and Spruce Streets we came to another and much larger operation in terra-cotta, the American Tract Society's Building, by Mr. R. H. Robertson. In front of it stood two working brick masons, engaged in an animated discussion as to whether the upper sixteen stories (a portion of which had then been erected) were stone or terra-cotta. One of them, as a final master stroke, attempted to silence his more dubious comrade by declaring that he *ought to know*, as during the past month he had been working on the job, and that the work had been delivered from day to day by the trucks of the New York Architectural Terra-Cotta Company. This man was right, so it had; and so also had the work made by this company been delivered on the Wolfe, the Manhattan Life, and many of the towering office buildings that more than any other thing excite the wonder, if they do not always compel the admiration, of foreign and domestic visitors. The man of British birth came and saw, and — got flabbergasted. While reluctant to believe that he had anything to learn about terra-cotta making *this* side the Atlantic, he appeared a good deal perplexed with his first object lesson. There will doubtless be other and similar guessing competitions before the end of the year, in New York and elsewhere. When the work now under way by this company alone comes to be submitted to architectural and technical criticism, it will

be seen how great has been the progress in the art and science of this important industry during the past two years. But it is no longer a question of imitating the texture of stone, or of matching it in color. To do this with ease and certainty is now considered a matter of course, but it is not, and ought not to be, the ultimate aim of those engaged in its manufacture. A further step has been taken, and that step is in the right direction. We are on the threshold of a new era in the production of colors, and tints of color, that cannot be procured in any of the building stones in general use.

Architects who have long craved for more cheerful and harmonious color combinations were restricted to a choice from three or four available building stones. As often as otherwise, it was "Hobson's choice" with them. The one under which they were prone to take refuge is perishable within thirty years, as is painfully apparent on walking through any of the sombre brownstone districts of even more recent date. Lake Superior redstone followed as a substitute, but it bleaches and loses its color, and is but little better in point of durability, as may be seen, for instance, on the ten-year-old portico of the Murray Hill Hotel, and other discouraging examples. Beyond these we have little save marble and Indiana limestone, the latter becoming monotonous from a too general and indiscriminate use. Granite will hold its place for basement stories, polished ashlar, columns, and special features where crushing weight has to be sustained; but it will always be shut out from general use by the cost of manipulation, except in the form of ashlar or quarry-faced monoliths.

The bulk of the twentieth-century architecture must inevitably be terra-cotta in its main features. The steel skeleton construction has already afforded unlimited opportunities for its use, and will continue to give a tremendous impetus to its further development. Those who have studied the skyward tendencies of all city work are getting equipped to meet the growing demand for a polychrome building material that can be relied upon to keep its color. This demand is taking the form of constructive as well as decorative qualities, and of an enamelled as well as of a non-reflective surface treatment. Every day brings improvements in the manufactured article. These are noticeable in color, texture, reliability in burning and mechanical fitness, until we are now reaching something of an exact science. The demand for a really first-class article has kept pace with the ability of the makers to supply it promptly or under a reasonable time limit. This has in turn brought into existence a new community of terra-cotta workers. We are now getting a staff of trained draughtsmen who are of necessity something more than picture makers, and of experts on special methods of construction, based on the requirements of each case as well as the exigencies of manufacture, and who make these branches their life's study. Inducements have been offered sufficient to attract modellers from the best schools in Europe, and work is being turned out that equals if it does not in some respects surpass the hitherto matchless examples of Italy's Renaissance. Carvers in stone have thus been forced by competition and comparison into a keener struggle for existence. Nothing of any importance in this line is now attempted until it has first been modelled in clay and approved. From this a reverse is taken in plaster from which a cast is made also in plaster, and this is set before the carver *as a model* which he endeavors to imitate in stone, with varying success. There have been instances where this work was done in a terra-cotta works under the direction of the architect, and when complete the models were sent to building for the guidance of stone carvers. The general run of carving is stiff and mechanical, and the best specimens too often lack feeling and flexibility, and that indefinable touch, for which no better definition has been found than the very liberal one of "artistic merit." One thing is certain, that the work of the modeller reaches more nearly the perfect thing when from a plastic state it leaves his hands and slowly stiffens, passing through the fire without transfer or subsequent manipulation.

That timely and telling article in last month's BRICKBUILDER by Mr. George M. Fiske, in which he calls the attention of architects and others to the almost inexhaustible range of colors now at their disposal, is worthy the attention of those to whom it is addressed. It is to their own advantage to keep in touch with the higher aspirations of the building public. There is room here for the expression of taste and fitness, where these can be embodied in an imperishable material, and at a cost formerly paid for rectangular openings in a brick wall. The four-inch veneer of "face-bedded" brownstone showing unmistakable signs of lamination is no longer a guarantee of respectability. Mr. Fiske (if I mistake not) is himself a veteran clay-worker, who has gone unscathed through the fiery ordeal of terra-cotta making during the doubtful years that followed its birth as an infant industry (now no longer needing special protection). His remarks do not indicate any desire to rest on his laurels, much less to retire from the race; rather a tendency to press onward and upward, in pursuit of architectural customers as progressive as himself. He asks them to test the further possibilities of clay, and appears willing to satisfy all legitimate demands in the direction of "fireflashed" bricks, etc. It is truly refreshing to know that he repudiates all partnership with paint and painters. These have their use elsewhere, but genuine terra-cotta has no use for them. They have been called into requisition before now, and an architectural journal that should have known better gave publicity to some pages of sophistry intended to palliate, if not to propagate, their universal application; but shams and subterfuges could only lead their apostles to certain disaster. Those who resorted to these and similar makeshift methods of producing terra-cotta while diligently digging their own graves, and making involuntary confession of their failure, were at the same time storing up a legacy of doubt and derision, from which the business in general has suffered, and from which it has not yet fully recovered. Verily in this as in other things "the evil that men do lives after them."

It is only fumblers who resort to fakes. Capable manufacturers succeed best without them, and they should at their next convention take a solemn pledge against such practices. Terra-cotta is not an artificial stone, or an imitation of anything. It can claim recognition on its own inherent merits, and without disguise of any kind. It *can* be made of even color, and homogeneous throughout, and for special requirements it can be vitrified to any extent. What more need be askd? As well "paint the lily or gild refined gold." Weather-proofing it with some occult pigment under any other name will smell as malodorous. It will spoil its texture, obliterate the emblems of its plastic origin, filch away its good name, and rob it of that charm which gives it character, and which belongs to it by rightful inheritance. Badly made terra-cotta is bad for everybody, irrespective of who bears the odium of being its godfather. By the same rule a well-done job is a universal benefit, no matter who may be entitled to the credit of having stood sponsor for it. The better the work the more will it be used, and the wider will be the advantages that accrue. Thus does the question become one of public concern. Its enemies are of its own household. It lies with the manufacturers of terra-cotta themselves more than with any other part of the community to hasten or retard its manifest destiny as the popular building material of the future. The order which Gen. Dix gave in reference to the man who attempted to haul down the Stars and Stripes should be metaphorically meted out to those who seek to lower the high standard of merit and reliability which in capable hands it has already attained.

(*To be continued.*)

THE new mantel and fireplace for "The Breakers," Cornelius Vanderbilt's private residence, Newport, R. I., is of terra-cotta, seventeen feet high, and cost seventy-five thousand dollars. The material was taken from the ruins of an old Roman villa at Pompeii.

THE building material business formerly carried on by the firm of Pinkham & Company is assumed, and will be conducted by I. W. Pinkham Company, 17 Milk Street, Boston. The new company carry a fine line of brick, terra-cotta, roofing slate, and slate products.

Fireproofing Department.

Conducted in the Interests of Building Construction to Prevent Loss by Fire.

THE MODERN OFFICE BUILDING.

BY J. HOLLIS WELLS, C. E.

(Continued from April Number.)

ONE of the most recent examples of a model building is one designed for Mr. Joseph Fahys by Clinton & Russell, architects. This building is located in the jewellers' district, on an irregular-shaped piece of property, is twelve stories in height, and constructed on the most approved principle. The sub-foundation is a wet, running mixture of sandy loam and mica, very compact when properly confined, but treacherous when carelessly prepared. Over the entire plot is spread a solid foundation of concrete and steel beams, a total of three feet in thickness, distributing the weights with an average pressure on the subsoil of about three tons per square foot. The columns are built of steel I beams, channels, and plates, and start from footings of compound riveted girders four feet high and extending the full length of the building on both sides. All beams and girders are of steel, and the entire construction is designed for a dead load of sixty pounds per square foot and a live load of one hundred and forty pounds per square foot. The columns, in addition to carrying these loads, are designed to carry the resultant strains of a wind pressure against the sides of the building of twenty-five pounds per square foot. Wind bracing consists of triangular pieces built of plates and angles and are riveted to the columns, and the girders are riveted in turn to the bracing, so that the entire structure is absolutely rigid. Fig. 2, Plate 37, shows the general detail of the column and girder connections. This building is undoubtedly one of the strongest in the city. There has been no appreciable settlement or sway, and although one front is twenty-five feet wide and one hundred and sixty feet high, the effect of a high wind has as yet been absolutely unnoticed. All the structural steel work was painted two heavy coats of Eureka paint before the brickwork was commenced. Construction was commenced late in December, and ten weeks later the roof ties of beams was completely set, making a total of about one thousand tons of material furnished, set, and every connection riveted up complete in less than three severe winter months.

The fronts on both streets are an adaptation of the style of Francis I. The two lower stories are of granite and Indiana limestone. The limestone is richly and handsomely carved, and is topped over the second story with an elaborately detailed balustrade. The upper story walls are faced with a light buff brick costing thirty dollars a thousand, and the entire front is topped out for one story in height with terra-cotta and surmounted with a richly designed railing cast in the same material. Fig. 3, Plate 37, shows the detail of the terra-cotta cornice and rail, which is of a light rich tint to match the brickwork, and is a most excellent sample of the best class of work made in this vicinity.

Fig. 1, Plate 37, shows the plan or lay-out of this building, and serves in general to describe the usual design for nearly all the better class of buildings, and the building has been constructed throughout on the lines already laid down. The very best of workmanship has been insisted on, and the most satisfactory of results have been obtained. All offices are light and airy, and the electric elevator service is regular. This building is described because it is one of a large class of buildings similar in design, and built for the same general use. To describe one office building properly built is to describe them all.

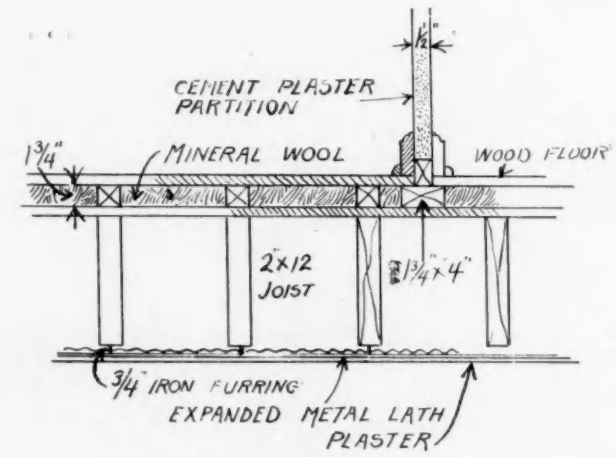
The cellar of a modern office building is almost entirely given up to the power, heating and ventilating plant. There are usually at least two large high-pressure tubular boilers, two steam or electric pumps, one for feeding boilers and the other for house and fire service, two and oftentimes more dynamos with their engines, either additional dynamos or else pumps for furnishing power for the elevators; motors or else cylinders and tanks, as the elevators are electric or hydraulic, to lift them, a feed-water heater, a pump governor, a blow-off tank, hot water and storage tanks, electric service switchboards, and a network of power, heating and ventilating pipes with their regulating valves, etc. A system intricate enough in its lay-out to tax the resources of an expert engineer in order that it may be complete, economical, and at the same time absolutely efficient in all its parts.

So many of these buildings have been built within the past few years that it is now an easy matter to figure out the cost of construction. A first-class office building, carefully planned and well specified, can be built for not less than from thirty-six to forty cents per cubic foot. This includes measurements taken from the cellar bottom to the highest point of the roof tier of beams, and on the outside of all walls. It also includes the cost of all partition work, gas and electric light fixtures complete. A building on a plot of ground 50′ x 100′ was built twelve stories high, or about 155′ from cellar floor to top of roof beams, and cost in the neighborhood of $250,000, or approximately 38½ cents per cubic foot. The property alone is valued at $300,000, making a total valuation of $550,000 for building and property. It costs to run this building, exclusive of taxes and larger repairs, and including wages of a janitor, an engineer, a fireman, four elevator men, scrub-women, fuel, supplies, etc., $12,500 per annum. A building of this class rents at from $1.75 to $2.50 per square foot of floor surface. The above building contained 36,000 square feet at an average rental of $2.00 per square foot, a total rental of $72,000 per annum. The modern office building is undoubtedly therefore a paying investment if properly managed. As to whether the thing is being overdone, and too many buildings are being erected, will be decided in time, but there is no doubt that there is still plenty of demand for improved office space, and that the old-time structures must be replaced by the structure of the present decade. The one great mistake of the age is that in the spirit of rivalry that exists as to who shall have the most attractive building, the question of general health and of real architectural effect is overlooked. The narrow streets of the metropolis are being lined on both sides with enormously high piles of brick, stone, and steel, and the sidewalks, far below the tops of the buildings, are usually damp, and the air is laden with malaria, for no sunlight ever reaches to the curb, and the low-lying strata of air is heavy and oppressive. A building over 170 feet in height is a monument of engineering skill and cannot be made an architectural success. No combination of brick, stone, and terra-cotta can relieve the structure of its bare, straight lines and its top-heavy effect. The building of the American Surety Company, twenty stories in height, an immense piece of work, excites admiration simply on account of its effect as a high building; the building of the Mutual Life Insurance Company, on the contrary, is one of the best examples of a moderately high building, and from an architectural standpoint is a most beautiful design. It is only a question of time, therefore, when this fad will play out, and buildings of a normal size will be built. This matter is even now being agitated by the authorities, and will be made a subject for legislation; in fact there are, at this time, current rumors to the effect that a bill has been drafted for presentation to the Legislature which will regulate the extreme height of any future building that may be erected in the city of New York.

SOLID PARTITIONS.

ONE of the new apartment buildings just completed in Chicago is the "Dubuque," Treat & Foltz, architects. The structure is one hundred feet square, eight stories high, and contains forty-seven suites of apartments, beside a drug store, a physician's and a dentist's office, and baths, laundries, and servants' sleeping-rooms in basement.

One item of interest is the solid one and one half inch partitions used throughout the eight stories, which vary in height from nine to thirteen feet. The saving in space by the use of the one and one half inch partitions as compared with a four-inch tile partition is nearly three feet in the thickness of eight partitions, or a saving of floor area in each story of the Dubuque Building of five hundred square feet, equivalent to a room over twenty feet square. The partitions in this building are made of a cement plaster (lime mortar will not answer the purpose) on expanded metal lath, the latter being first wired to five-eighths inch channel iron studs, sixteen inches apart.



SECTION OF FLOORS.-"DUBUQUE" BLDG.

PLAN SECTION OF DOOR TRIM.

(See accompanying sketch, showing construction.) Though seemingly very flimsy during erection, the partitions are, after the plaster is set, stiff and strong enough for ordinary residence or office purposes, and seem stable enough to stand continued slamming of doors better than tile partitions. In fact, such partitions have stood the test of four years' use in one office building. The greatest difficulty is to hold these thin partitions straight and true till the plaster is set. The dampness in a last finish putty coat is sufficient to warp the partitions like cardboard. This, of course, makes crooked and vexatious work with the wood finish. Another drawback is the time required to dry thoroughly one and one half inches of solid plaster, and the consequent danger of getting trim and kalsomine on too soon in rush work.

FIRE LOSSES. — London has only forty fires a week, and most of these are insignificant. If the great city were constructed on the American plan, its fire losses would be twenty million dollars a year instead of a fraction of that sum. — *Globe-Democrat*.

EXHIBITION BY THE ELECTRIC FIREPROOFING COMPANY. — DEDUCTIONS.

BY F. E. CABOT.

THE exhibition given in Boston by the Electric Fireproofing Company on Saturday, May 3, is especially interesting as an evidence of the growing tendency among those who are connected with the construction of buildings to use every means afforded, science or art, in producing material which is at the same time of low cost, and in some measure at least fire resisting. The claim of this particular company is, as we understand it, that wood which has been treated by their process becomes, to a large degree, non-inflammable, using this word in its true sense, *i. e.*, not developing flame. No claim is made, as the writer understands it, that wood, when treated by their process, will not carbonize or become charcoal when subjected to high temperatures, but the claim is made, and the writer believes fairly made, that any wood can be so treated by their process that it will not, under any circumstances, produce flame, and that whenever the surface of wood so treated has been carbonized by flame against it, no additional fire will come from the wood itself. In other words, as soon as the fire is removed the charcoal will at once, without assistance, extinguish itself, and that moreover the layer of charcoal thus formed will be a great protection to the wood not directly in contact with the flame.

The exhibition referred to above was made in and around a small structure, built enirely of wood which has been through this company's process, and it required a careful examination to determine that it was not made of ordinary lumber. The building was approximately twelve feet six inches square, and eight feet to the eaves, with a hipped roof, terminating in a wooden chimney two feet square, and about eight to ten feet high, over which was a wooden cap, carried on four posts two feet above the top of the chimney. The entire structure was raised about two feet from the ground on wooden posts, and had openings in three sides, two windows and a door, the windows being opposite to each other, and the door in one of the intervening sides. The fourth side was without a break, and on this side there was no interior finish, the studding being entirely unprotected, except by a coating of white paint, made, as the writer understands, of a material very similar to that with which all the woodwork had been treated before it was put together. The outside boarding was covered with two layers of sheathing paper and clapboards of ordinary form, and the roof was shingled. The lumber was of such dimensions as would be used in the construction of an ordinary dwelling, and the whole building was made attractive by a coat of paint. The inside walls in which there were openings were sheathed for about three feet from the floor with a moulded trim, and the space above was lathed as if ready for the plaster. The sheathing, which was of various kinds of wood, was planed smooth, but none of the woodwork on these sides was painted or finished in any other way. The whole structure was raised about two feet from the ground on posts at each corner, and the space under the floor was entirely open and unprotected.

The first part of the test was to demonstrate the resistance of the building to a fire from the outside, and for this purpose a fire of shavings and split pine logs was built on the ground directly under the shuttered window. This was maintained for half an hour, and from the inside of the building no effect was apparent except from the smoke which worked through the joints of the floor boards. At the end of this time a fire was built under the unprotected window and another inside the house, directly on the floor, and the first fire was supplied with fresh fuel so that three fires were playing directly on the building. These fires were maintained for half an hour more, and then a gallon of kerosene oil was thrown on the fire inside the building. The effect was very striking, as a mass of flame poured out of the wooden chimney, and the heat became so intense that the panes of glass in the window melted down into a solid mass, now in the possession of the writer. This lasted for six minutes, after which the fires were allowed to die down to coals, which were extinguished by a few minutes' use of

a garden hose. The only apparent effect on the building was the destruction of the lathing and the bars of the window frames, and a hole about three feet square in the floor, just over the first fire, which, it should be remembered, had been burning over an hour. All the wood on inside of the building was charred to a depth varying from a quarter to three quarters of an inch, but the building from the outside looked almost intact, and the floor, except at the edges of the hole, was strong enough to bear the weight of two men.

It may be fairly said, therefore, that the claims of the company's representative, Mr. Max Bachert, seem to have been sustained, but in all fairness it must be said that, even assuming that these claims are fully proven, there still remains some doubt as to the final value of the process. With all due respect to the company, it is, without doubt, true that similar processes for the preservation of wood from *decay* have been thoroughly tried at least twenty years ago, and further, that at least one of the chemicals used in these processes has a very considerable value in resisting the tendency of wood to burst into flame. Yet to-day we hear little of these processes, although they have had ample opportunity to prove their value. Furthermore, so far as the writer could learn, the company is not as yet prepared to give any figures as to the probable additional cost of lumber treated by their process, and it is, therefore, impossible to judge of the comparative cost of wood thus treated, and material truly fire resisting like brick and other fire-made clay products.

The tendency to-day is to go further than the ground covered by this company's patents, and to call for material which will resist heat for some time without any deterioration, and which can be depended on in case of conflagration to stand as a barrier in the path of the flames. Such a barrier, wood can never be, even though treated so as not to add fuel to the flame. Brick and similar *fire-made* materials alone can be depended on for this work, and in combination with steel and iron, which *they* can thoroughly protect, must form the building material of the future. If, in a building of such construction, it may be thought best to use wood rendered non-inflammable, it will add to the safety of the interior, and where fireproof construction is not used the use of such wood will add something to the protection which is now sought everywhere, but this is all that can be expected from it, and no careful observer will believe that in any sense it can take the place of fireproof material.

A FRENCH SUBSTITUTE FOR FIRE BRICK.

A CORRESPONDENT of the London *Colliery Guardian* says: "On account of the difficulty of obtaining fire bricks of uniform quality, except from Great Britain, M. Bebois-Reuleaux has devoted considerable attention to finding a substitute at lower cost. After many experiments he has succeeded in obtaining an infusible product containing from ninety-five per cent to ninety-eight per cent of pure silica, which, mixed with another product, is said to insure perfect homogeneity, and at the same time absolute infusibility. The raw materials, which are found abundantly in several of the French departments, are so cheap that the bricks may be produced at half the cost of English for an equal quality. Some of these bricks tried in a blast furnace, at the hottest place, are reported by the manager to have stood thoroughly; and in the bridge of a puddling furnace, where only English bricks can withstand the heat, the new bricks were found quite satisfactory, as also in the bridge of a heating furnace worked for thirteen hours continuously. At some steel works, moreover, a half brick of the new manufacture was exposed during a whole day in a Siemens-Martin furnace, and was taken out without having undergone any change, and with the corners still sharp."

IN the June number the series of articles on Fireproof Floor Arches, by George Hill, C. E., will be resumed. Mr. Hill has recently completed a series of tests of arches which were constructed by a prominent fireproofing concern, and the results of these tests will be given.

Mortars and Concrete Department.

Devoted to Advanced Methods of using Cements and Limes in Building Construction.

AMERICAN CEMENT.

BY URIAH CUMMINGS.

IV. — *Continued.*

TABLE OF ANALYSES. Hydraulic Limes and Cements.

Number	Silica	Alumina	Iron oxide	Lime	Magnesia	Potash and Soda	Sulphate of lime	Carbonic-acid water and loss
1	16.05	1.92	3.22	77.29	1.52	.....	.....	.....
2	24.33	3.73	.....	71.94	.....	.....	.....	.....
3	29.71	5.35	3.29	59.53	0.95	1.17	.....	.....
4	20.57	1.13	.....	77.76	0.54	.....	.....	.....
5	28.14	9.10	3.20	53.34	1.00	2.80	.....	2.42
6	27.88	6.19	4.64	56.45	4.84	.....	.....	.....
7	25.31	7.03	9.74	56.17	1.75	.....	.....	.....
8	44.50	15.00	12.00	8.80	4.70	5.50	.....	9.50
9	48.94	18.75	11.92	6.40	2.42	3.93	.....	7.64
10	19.75	7.48	5.01	60.71	1.28	0.75	1.64	3.38
11	24.90	8.00	3.22	59.38	0.38	0.50	1.46	2.16
12	20.42	12.00	1.87	63.13	0.58	.....	.....	2.00
13	23.36	8.07	4.83	58.93	1.00	0.50	0.85	2.46
14	22.74	7.74	3.70	56.68	0.57	0.63	1.66	6.28
15	21.11	11.30	3.36	58.03	2.93	0.71	0.51	2.05
16	24.30	2.61	6.20	39.45	6.16	5.30	.....	15.23
17	34.66	5.10	1.00	30.24	18.00	6.16	.....	4.84
18	23.16	6.33	1.71	36.08	20.38	5.27	.....	7.07
19	26.40	6.28	1.00	45.22	9.00	4.24	.....	7.86
20	25.28	7.85	1.43	44.65	9.50	4.25	.....	7.04
21	30.50	6.84	2.42	34 38	18.00	3.98	.....	3.78
22	29.98	6.88	2.50	33.23	17.18	7.10	.....	3.13
23	30.84	7.75	2.11	34.49	17.77	4.00	.....	3.04
24	27.30	7.14	1.89	35.98	18.00	6.80	.....	2.98
25	27.98	7.28	1.70	37.59	15.00	7.96	.....	2.49
26	28.38	11.71	2.29	43.97	2.21	9.00	.....	2.44
27	19.90	5.92	1.14	46.75	16.00	8.02	.....	2.27
28	22.62	7.44	1.40	40.68	22.00	2.23	.....	3.63
29	27.69	8.64	2.00	42.12	14.55	2.00	.....	3.00
30	24.34	8.56	2.08	61.62	0.40	2.00	.....	0.80
31	22.91	8.00	1.90	61.76	2.70	.....	.....	2.63
32	23.32	6.99	5.97	53.96	7.76	.....	.....	2.00
33	22.10	15.00	3.21	55.98	0.37	.....	3.34	.....
34	24.94	9.00	1.16	63.64	1.26	.....	.....	.....
35	27.60	10.60	0.80	33.04	7.26	7.42	.....	2.00
36	33.42	10.04	6.00	32.79	9.59	0.50	.....	7.66
37	22.58	7.23	3.35	48.18	15.00	.....	.....	3.66
38	22.44	6.70	2.00	32.73	0.67	.....	.....	35.46
39	26.61	10.64	3.50	42.12	13.12	2.00	.....	2.01
40	17.50	6.50	3.00	36.51	.....	.....	.....	36.49
41	22.21	16.48	1.67	39.64	17.50	.....	.....	2.50
42	32.06	21.27	2.11	35.56	7.00	.....	.....	2.00
43	28.45	2.24	2.00	56.00	10.00	.....	.....	1.31
44	18.59	9.14	1.00	40.70	27.00	.....	.....	3.57
45	19.52	1.97	1.29	41.51	1.47	.....	.....	34.24
46	28.02	10.20	8.80	44.48	1.00	0.50	.....	7.00
47	19.35	7.00	4.50	63.75	.....	.....	.....	5.40
48	21.14	6.30	2.50	66.04	1.11	.....	.....	2.91
49	22.69	7.30	2.87	62.28	1.08	.....	.....	3.78
50	20.80	7.39	2.61	64.00	.....	.....	.....	5.20
51	23.20	7.03	2.41	64.19	0.97	.....	.....	2.20
52	22.89	8.00	2.44	63.38	2.30	.....	.....	0.99
53	25.15	8.00	3.28	49.53	13.78	.....	.....	0.26

REFERENCE.

No. 1. Hydraulic Lime, Aberthaw, England, used in the construction of the Eddystone Lighthouse.

" 2. Hydraulic Lime, Lyme Regis, England, used in the construction of the London docks.

" 3. Eminently Hydraulic Lime, Holywell, Wales, used in the construction of the Liverpool docks.

" 4. Hydraulic Lime, Teil, France.

" 5. Hydraulic Cement, "King's Farm," on Susquehanna River, near Williamsport, Penn.

" 6. Roman Cement, Rudersdorf, Germany.

" 7. Roman Cement, Isle of Sheppy, England.

No. 8.	Pozzuolana, near Rome, Italy.		
" 9.	Trass, from the valley of the Rhine.		
" 10.	English Portland Cement,	"	K., B. & S." brand.
" 11.	German "	"	Alsen & Son.
" 12.	Natural "	"	Boulogne, France.
" 13.	American "	"	"Giant," Egypt, Penn.
" 14.	English "	"	given by Reid as first quality.
" 15.	German "	"	" " " " " "
" 16.	Buffalo Hydraulic	"	Buffalo, N. Y.
" 17.	Utica "	"	Utica, Ill.
" 18.	Milwaukee "	"	Milwaukee, Wis.
" 19.	Louisville "	"	"Fern Leaf," Louisville, Ky.
" 20.	Louisville "	"	"Hulme," Louisville, Ky.
" 21.	Rosendale "	"	"N. L. & C. Company, Rosendale, N. Y.
" 22.	"	" "	"Rock Lock," Rosendale, N.Y.
" 23.	"	" "	"N. Y. & R." Rosendale, N. Y.
" 24.	"	" "	"Hoffman," Rosendale, N. Y.
" 25.	"	" "	"Norton High Falls," Rosendale, N. Y.
" 26.	Cumberland "	"	Cumberland, Md.
" 27.	Napanee "	"	Napanee, Ont.
" 28.	Akron "	"	"Newman," Akron, N. Y.
" 29.	"	" "	"Cummings," Akron, N. Y.
" 30.	California "	"	South Riverside, Cal.
" 31.	American Portland	"	"Saylor's," Coplay, Penn.
" 32.	Fort Scott Hydraulic	"	"Brockett," Kansas City, Mo.
" 33.	Gate of France Hydraulic Cement, France.		
" 34.	Vassy Hydraulic Cement, France.		
" 35.	Utica "	"	La Salle, Ill.
" 36.	Shephersdstown Hydraulic Cement, Shepherdstown, Va.		
" 37.	Howard Hydraulic Cement, Cement, Ga.		
" 38.	Hydraulic Cement Rock on Platte River, Nebraska.		
" 39.	Mankato Hydraulic Cement, Mankato, Minn.		
" 40.	Hydraulic Cement Rock, near Salt Lake City, Utah.		
" 41.	St. Louis Hydraulic Cement, near East Carondelet, Ill.		
" 42.	Barnesville Hydraulic Cement, Barnesville, O.		
" 43.	Warnock "	"	Warnock, O.
" 44.	Austin "	"	Austin, Minn.
" 45.	Hydraulic Cement Rock, Blacksburg, S. C.		
" 46.	Round Top Hydraulic Cement, Hancock, Md.		
" 47.	German Portland Cement,	"	Dyckerhoff" brand.
" 48.	" "	"	"Germania" brand.
" 49.	" "	"	"Porta" brand.
" 50.	American "	"	"Empire," Warners, N. Y.
" 51.	" "	"	"Medusa," Sandusky, O.
" 52.	" "	"	"Alpha," Phillipsburg, N. J.
" 53.	James River Hydraulic Cement, Balcony Falls, Va.		

This table of analyses has been compiled with the utmost care, no labor having been spared to make it as perfect as possible.

Among the authorities consulted and relied upon are Beckwith, Bennett, Bode, Boynton, Cox, Davidson, DeSmedt, Dodge, Dorr, Miller, Newberry, Ogden, Reid, and Winchell, analysts and chemists of established reputation.

In many cases a selection has been made from several analyses of the same brand of cement, and in this, as in all other respects, great care has been exercised with a view to formulating a table which may be confidently relied upon.

(*To be continued.*)

THE Howard Hydraulic Cement Company, Cement, Ga., will rebuild its cement mill, and is in the market for machinery for same.

A COMPANY has been formed in Dayton, O., for the purpose of manufacturing Portland cement.

PHILADELPHIA, PA., May 14, 1895.

EDITOR OF THE BRICKBUILDER:

Sir, — I note in the April issue of your magazine that Mr. Leonardt takes some exceptions to my remarks on American Portland cement, and his views coincide with the former remarks made by Mr. R. Tucker, to wit: "The Portland cement of American manufacture has a long road to travel before reaching the standard of excellence achieved by its rivals across the water." Now I maintain that the American Portland cements, as a class, have attained that degree of excellence possessed by the cements (as a class) that are made across the water. (See tests published in THE BRICKBUILDER of November, 1894.) All impartial and thorough tests made on the general run of foreign Portlands in comparison with the American Portlands, on sale in this part of the country, prove this to be a fact.

Now if Mr. Leonardt or Mr. Tucker have any thorough tests made with the leading American Portlands in comparison with the foreign Portlands, which show the latter to be so very much superior to the former, send them to THE BRICKBUILDER and let the readers see them. If they have not got any such data to back up their opinions, they have done the American manufacturers, who are now making cement equal to the best and superior to many of the foreign brands which now have a large sale in this country, a great injustice by publishing such statements.

In addition to the tests published in THE BRICKBUILDER of November, 1894, any interested reader can get from the Water Commission of St. Louis their last report, which gives the results of tests on all the cement used in the construction of the new water supply for St. Louis. The tests were made of one part cement to three parts sand, which is the test recommended by the German Association of Cement Manufacturers, and are carried out from one week to two years. This report shows that a brand of American Portland cement showed a strength of ten to twenty per cent greater than two of the German brands (Alsen and Dyckerhoff) Mr. Leonardt mentions.

In reference to Mr. Leonardt's statement that the "Saylors Portland Cement Works," owned by the Coplay Cement Company, although the largest in this country, are not to be compared with the Dyckerhoff, Alsen, Germania, Mannheimer, or Heidelberg works, and that if I would visit those factories I would find a superior plant than those at Coplay, would say that before I made the statement last October in THE BRICKBUILDER I was thoroughly acquainted with the Coplay plant as well as the leading European works. In the summer of 1892 the Coplay Cement Company decided to greatly increase their plant, the demand for their Portland cement being greater than the output, which was one hundred and fifty thousand barrels per annum. Having been identified with the sale of American Portland and being interested in and acquainted with the manufacture of cement, I was invited to spend the winter of 1892 and 1893 in Europe with Mr. Chas. M. Saeger, superintendent of the Coplay Cement Company, to investigate the different processes of making cement and the working of the different kilns. Among the works visited in Germany were the Alsen, Germania, and Dyckerhoff plants. The Germania Works at Lehrte, having just been entirely rebuilt on account of destruction by fire, were about the newest type of a German mill. In no factory visited by us did we find more complete laboratories than those at Coplay. The mills were just as dusty and some of them more so; but whether this dust is drawn out of the mills by exhaust fans (as it is at Coplay) or not has nothing to do with the quality of the product manufactured, but is done mainly on account of the health and convenience of the employees.

We did not see a factory in Europe where more conscientious care was taken to select the clinker than at Coplay, Pa., and in no factory did we find so little under-burnt material as at home, which we attribute to the fact that the cheapness of fuel in this country leaves no inducement for the manufacturer to skimp his fuel and run the risk of getting a large percentage of poorly burnt cement. Although in most German factories this under-burnt material was being picked out, no attention was paid to it in the English factories visited by us, and all the contents of the kilns found their way to the grinding mills.

The new kilns at the Saylors American Portland Cement Works are of a newer type of continuous kiln than those used in the German factories, and are very much more economical in fuel. As to the new German mills being better constructed than the American mills, would say that the new works of the Coplay Cement Company are built of brick, concrete, and steel, and in arrangement, light, ventilation, etc., are far superior to any factory Mr. Leonardt mentions, or that was in existence in Germany in the winter of 1892 and 1893. It is most likely that Mr. Leonardt has not seen the works at Coplay for some years, and I would suggest that he, or any one else who has seen the large works in Germany, take a trip to the Saylors Portland Cement Works at Coplay, Pa., before attempting to draw comparisons, and if the party is acquainted with the manufacture of cement, the comparison cannot help being in favor of the American mills.

The encourgement and preference now being given by our leading engineers to the American Portland cements bid fair to largely increase its manufacture, so that at no distant day the Portland cement consumed in the United States will all be made at home. This, I believe, is the honest wish of every American.

WM. G. HARTRANFT.

MR. MICHELE'S test for Portland cement for 1895 is as follows: Pats ½ inch thick in water, absolutely sound at seven days; tensile strength, 400 pounds per square inch at seven days; fineness, five per cent residue on a 50 sieve. The pats to be gauged on glass, immersed in water immediately and left there for the whole period. One pat to each three bricks. The test bricks to be gauged by a skilled man, with a minimum quantity of water, and well rammed into moulds. The average of three to be taken, which shall represent about 100 tons or less. The strain to be applied as quickly as possible. The sieve to have 2,500 holes per square inch, and to be of wire not less than .007 of an inch — 34 B. W. G. — in diameter. Shaking to be continued for five minutes.

TO THE EDITOR OF THE BRICKBUILDER:

Dear Sir, — I have been surprised to read in an American journal the remarks of Mr. F. Tucker and Mr. C. Leonardt derogatory of the character of American Portland cement. Having been connected with the sale and the manufacture of American Portland cement since it was first made in this country, and having probably as large a familiarity with its use as any one, I want to contradict most emphatically the statement of Mr. Leonardt that American Portland cements "lack continued uniformity and tensile strength," and that "for a time they will be equal to the best imported, and all at once the same factory will bring an article into the market with hardly any tensile strength, far below the average, or which sets too fast or not at all."

I have neither time nor desire to waste words upon either Mr. Tucker or Mr. Leonardt, but I send you herewith a record of nearly three hundred thousand barrels of Giant Portland cement, which have been used on the most important works that have been done on the American continent within the past ten years, which records, covering a period of nearly eight years on practical work and laboratory tests, show conclusively the absolute incorrectness of the statements of Mr. Leonardt. When either of the gentlemen mentioned can produce a record on imported cement, similar to that which I append hereto, containing results on five separate and distinct works, upon samples in the laboratory and in the mortar boxes, made by innumerable testers and mortar mixers, and can show an absolute, uniform growth and continuity, such as these tests do show, *then* I think it will be time for the American manufacturers to be called to the defence of American Portland cement, which the tables here presented conclusively show to be not only as good, but better than the imported article.

Yours truly,

R. W. LESLEY,

Treasurer.

Long-Time Tests.

Tests of over Three Hundred Thousand Barrels "Giant" Portland, on five of the largest dams in the United States; on the Niagara Falls Power-Tunnel, and the Reading Terminal Railroad and Station, in Philadelphia, for periods up to five years.

The only records of long-time tests on Portland Cement now published in the United States.

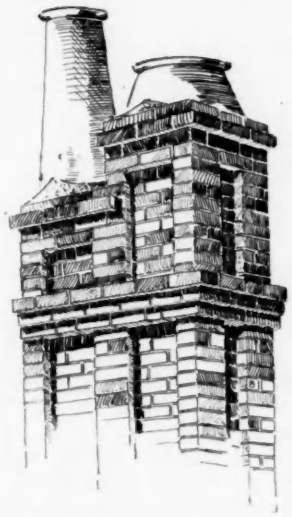
BRAND "Giant" Portland	MODE OF MIXING.	1 Day		1 Week		1 Mo.		3 Mos.		6 Mos.		9 Mos.		1 Year		15 Mos.		18 Mos.		2 Years		3 Years		4 Years		5 Years		FINENESS.		
		Number of Briquettes.	Average, in pounds.	Number of Briquettes.	Average, in pounds.	Number of Briquettes.	Average, in pounds.	Number of Briquettes.	Average, in pounds.	Number of Briquettes.	Average, in pounds.	Number of Briquettes.	Average, in pounds.	Number of Briquettes.	Average, in pounds.	Number of Briquettes.	Average, in pounds.	Number of Briquettes.	Average, in pounds.	Number of Briquettes.	Average, in pounds.	Number of Briquettes.	Average, in pounds.	Number of Briquettes.	Average, in pounds.	Number of Briquettes.	Average, in pounds.	Residue on No. 50 sieve, 2,500 holes to sq. in.	Residue on No. 74 sieve, 5,180 holes to sq. in.	Residue on No. 100 sieve, 10,000 holes to sq. in.
Sodom and Bog Brook Dams, New York Aqueduct. About 50,000 bbls.	Neat	1,025	140	1,398	348	220	422	180	540	100	634	30	638	180	682	30	687	110	672	110	694	90	736	60	774	10	840	.....	.....	18.0
	2 to 1	..	...	220	166	120	280	140	364	84	468	50	468	90	490	36	526	100	530	100	564	130	680	120	674	20	700			
	3 to 1	....	...	226	110	140	234	112	350	110	428	30	428	240	420	40	500	80	514	80	512	160	572	...	...	10	590			
Titicus Dam, New York Aqueduct. About 100,000 bbls.	Neat	3,448	157	4,165	380	637	476	505	529	478	575	479	599	350	642	181	594	135	584	137	641	62	668	...	...	...	...	.....	.....	11.7
	2 to 1	....	...	2,934	200	424	317	281	450	321	491	278	532	219	549	157	557	92	541	52	536	37	573							
	3 to 1	....	...	1,604	115	260	185	450	289	133	347	146	311	132	426	70	424	66	416	126	419	7	483							
Carmel and Craft's Dams, New York Aqueduct. About 40,000 bbls.	Neat	1,786	140	1,075	343	324	443	551	517	529	548	491	568	289	617	...	...	273	604	211	611	...	...	...	...	...	...	.....	.....	14.7
	2 to 1	....	...	1,642	182	216	308	85	445	87	480	76	472	43	585	...	...	49	477	55	475									
	2 to 1 from Mortar Box	....	...	61	164	51	237	8	385	11	494	8	491	7	367	...	...	12	516	3	568									
	3 to 1	....	...	13	100	13	174	7	319	12	372	11	398	10	413	...	...	8	401	10	406									
	3 to 1 from Mortar Box	....	...	45	112	31	166	6	310	8	480	7	500	9	541	...	...	7	437	5	406									
Reading Terminal Railroad and Station, Philadelphia. About 60,000 bbls.	Neat	....	...	329	315	267	376	69	451	15	549	16	576	10	523	1	640	...	...	...	...	...	...	...	...	...	...	.090	10 04	14.79
	3 to 1	....	...	536	79	431	129	104	174	20	228	15	225	47	261	5	287													
	2 to 1 from Mortar Box	....	...	190	84	180	144	17	219	13	234	25	281	62	325	12	417													
Niagara Falls Tunnel, Niagara Power Co. 60,000 obls.	Neat	....	...	495	321	309	420	12	514	24	562	...	...	24	661	...	...	...	...	...	...	...	...	...	...	...	...	.....	.....	14.9
	2 to 1	....	...	482	152	271	242	54	369	20	454	...	...	7	472															
	3 to 1	....	...	527	98	399	177	143	254	181	301	...	...	12	391															

The Mason Contractors' Department.

Conducted in the Interests of the Builder and the Contractor for Brickwork.

WHY DO THEY CRACK?

PERHAPS there is no part of the building business in which the skill and judgment of the contractor are taxed more than the successful dealing with compressible soils in the erection of an edifice; in fact, the public look upon the operation with caution, and are not satisfied unless the work is intrusted to men of practical experience and reputed care and judgment in the successful performance of such undertakings.



In constructing a foundation the object is not so much to secure an absolutely unyielding base as to secure one that will settle as little as possible, and *uniformly*. All soils will yield somewhat under the pressure of any building, and even masonry itself is compressed by the weight of the load above it. The pressure per square foot should therefore be the same for all parts of the building, and particularly of the foundation, so that the settlement may be uniform. If the axis of pressure does not coincide exactly with the axis of the base, the ground will yield most on the side which is pressed most; and as the ground yields the base assumes an inclined position, and carries the lower part of the structure with it, thus producing unsightly cracks if nothing more. The coincidence of the axis of pressure with the axis of resistance is of *first* importance. This principle is self-evident, and yet the neglect to observe it is the most frequent cause of failure in the foundations of buildings. Fig. 1 is an example of how the principle is violated. The shaded portion represents a heavily loaded exterior wall, and the light portion a lightly loaded interior wall. The foundations of the two walls are rigidly connected together at their intersection. The centre of the load is under the shaded section, and the centre of the area is at some point farther to the left, consequently the exterior wall is caused to incline outward, producing cracks at or near the corner of the building. Doubtless the two foundations are connected in the belief that an increase in the bearing surface is of first importance. Fig. 2 is another illustration of the same principle. The foundation is continuous under the opening, and hence the centre of the foundation is to the left of the centre of pressure; consequently the wall inclines to the right, producing cracks, usually over the openings. The centre of the load can be made to fall inside of the centre of foundation by extending the footings outwards, or by curtailing the foundations on the inside. The latter finds exemplification in the properly constructed foundation of a wall containing a number of openings. For example, in Fig. 3, if the foundation is uniform under the entire front, the centre of pressure must be outside of the centre of the base, and consequently the two side walls will incline outward, and show cracks over the openings. If the width of the foundation under the openings be decreased, or if this part of the foundation be entirely omitted, the centre of pressure will fall inside of the centre of base, and the wall will tend to incline inward, and hence be staple. One conclusion to be drawn from the above example is that the foundation of a wall should never be connected with that of another wall, either much heavier or much lighter than itself. Both are equally objectionable. A second conclusion is that the axis of the load should strike a little *inside* of the centre of the area of the base to make sure that it will not be *outside*.

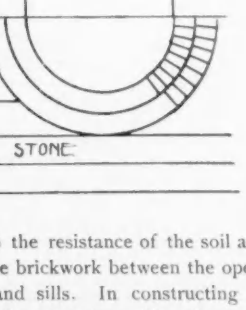


FIG. 2.

Any inward inclination of the wall is rendered impossible by the interior walls of the building, the floor beams, etc., while an outward inclination can be counteracted only by anchors and the bond of the masonry. A slight deviation of the axis of the load outward from the centre of the base has a marked effect, and is not easily withheld by anchors.

FIG. 3.

In places where the soil is loose and often even in good foundation, over which it is intended to place the apertures of the intended building, as to the doors, windows, etc., while the parts on which the piers are to be constructed are firm, the best plan is to turn an *inverted arch*, Fig. 4, under each of the intended apertures, as then the piers in sinking will carry with them the inverted arch, and by compressing the ground compel it to act against the under sides of the arch, which, if closely jointed, so far from yielding will, with the abutting piers, operate as one solid body. But, on the contrary, if this expedient of the inverted arch be not adopted, the part of the wall which is under the opening being of less height, and consequently of less weight than the piers, will give away to the resistance of the soil acting on its base, and not only injure the brickwork between the openings, but fracture the window heads and sills. In constructing so essential a part as the arch, great attention must be paid to its curvature; and where there is great weight depending, I strongly recommend the parabolic curve as the best adapted for this purpose; but if, in consequence of its depth, this cannot be conveniently introduced, the arch should never be less than a semicircle. The bed of the piers

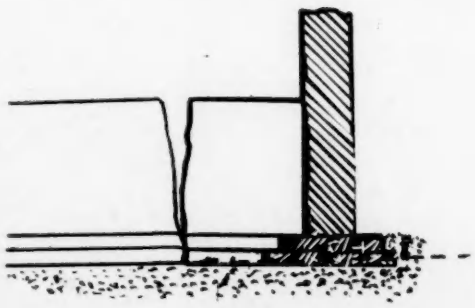


FIG. 1.

FIG. 4.

should be as uniform as possible; for though the bottom of the trench be very firm, it will, in some degree, yield to the great weight that is upon it; and if the soil be softer in one part than in another, that part which is the softest will, of course, yield more to the pressure and cause a fracture. If the solid parts of the trench happen to be under the intended openings and the softer parts where the piers are wanted, the reverse of the above practice must be resorted to; that is, the piers must be built on the firm parts and have an arch that is *not* inverted between them. In performing this, attention must be paid to ascertain whether the pier will cover the arch; for if the middle of the pier rest over the middle of the summit of the arch, the narrower the pier is the greater should be the curvature of the arch at its apex. Inverted arches are of great utility in giving stability to buildings, as they distribute the weight over the whole length of the foundation. When the radius of an inverted arch is small, that is to say, when it is under or not exceeding three or four feet, the best arrangement is to build two or more four-inch concentric rings as shown in figure, each of these rings being built as an independent arch laid in the strongest cement mortar. Never construct an inverted arch unless there is a strong abutment for them on both sides, as any settlement will tend to force the side wall out of perpendicular.

In conclusion, I will say that all foundations must be dealt with according to the attendant circumstances, and a knowledge of the method best adapted to any given conditions comes only by experience.

WILL. I. NOTT.

LEGAL POINTERS.

CONTRACTS SHOULD BE READ PERSONALLY. — A person who acts on the interpretation placed on a written instrument by a stranger, without having read it himself, cannot, in case the writing was capable of two interpretations, claim, as against its general meaning, that he in good faith acted on the other interpretation.

LACHES IN RELATION TO PARTY WALLS. — Equity will not compel the removal of an extension of a party wall on the grouud that it is a use not contemplated by the party-wall agreement, where the party complaining has made no objection until the extension is completed, but in such case he will be left to his remedy at law for damages.

EVIDENCE OF NEGLIGENCE. — The drawing apart of a splice in a wire rope provided by a company for hoisting, so that a workman is injured, is sufficient proof of negligence to make a *prima facie* case against the company, where there is testimony that well-made splices do not draw apart, and that the splices in such rope were not well made.

BREACH OF CONTRACT IN FURNISHING INFERIOR MATERIALS. — A building contractor is not excused for failure to furnish the quality of material contracted for by the fact that the work done was a fair average job for that class of building. And where a building contract calls for laths one and one fourth inches wide, and for number one rustic, and the best quality of joists and studding, and the contractor supplies laths one and one half inches wide, number two rustic, and a second quality of joists and studding, there is such a substantial breach of the contract as will warrant the owner in refusing to pay the contract price.

COMPENSATION FOR CONSTRUCTION OF PARTY WALLS. — An agreement between A and B that the former should erect a party wall on the line between their lots, and that the latter should have the right to use it at any time, on paying A one half the cost, is personal to both parties, and A is entitled to recover the amount agreed to be paid by B, though the party wall was first used by B's grantee, and although A had also conveyed his lot to the same grantee.

RETAINED PERCENTAGES NOT SUBJECT TO GARNISHMENT. — Where a construction contract provides for partial payments to the contractor as the work progresses, less ten per cent, to be retained by the owner to insure the faithful performance of the work according to contract, and for the payment of this percentage on the final completion of the work, the retained percentages are not subject to garnishment at the suit of the contractor's creditors, unless it appears that the contract was faithfully performed by the contractor, and that the balance of the work will be finished in like manner.

EDITOR THE BRICKBUILDER, BOSTON, MASS.

Dear Sir, — Replying to your correspondent, "A British Columbia Brickbuilder," in letter from Vancouver, B. C., under date of March 14, published in the April number of your valued magazine, in so far as it relates to the subject of liability and employees' accident insurance, the extensive experience of this office in placing insurance of this class in the various companies represented in the States leads us to believe that we have, perhaps, more liberal forms of contracts than are issued by the companies doing business in British Columbia.

Take, for example, the workmen's collective policy, or contribution policy, as it is termed by some of the companies. It is possible here to procure a contract covering one half wages for a term not exceeding fifty-two weeks, and all doctors' bills when the employee is disabled by accident either in or out of working hours, and in event of death by accident, under the provisions of this contract one half of a full year's wages, together with all doctors' bills and funeral expenses, are paid by the insurance company.

These contracts are issued in the name of the employer, are based on the estimated annual pay-roll, and are, as will be readily seen, much more liberal than the one mentioned by your correspondent.

It is customary to allow the employees to contribute a certain amount per week towards their own insurance, the amount varying according to the wages of the employees and consequent benefits derived.

This kind of insurance, of course, affords no relief to the employer when the injury is incurred in a manner which makes him legally liable, and for this reason most contractors hereabouts carry an employer's and public liability policy on forms covering absolutely all liability on account of injury to any person or persons whomsoever on or about the premises where the assured's operations are being conducted, or caused by any of the horses or vehicles owned or used by the assured in connection with his business.

These contracts are so broad that every feature of liability resulting from personal injury is fully covered, and accidents are of so frequent occurrence, and generally so expensive when they do come before the court, that no contractor or builder in this section feels like carrying the risk himself.

With eight companies in the field, bidding actively for the business, with a great variety of contracts and broad difference in rates, according to the views held by the various companies and based upon their own past experience with this particular hazard, as well as the additional and more important consideration, the financial standing of the company, — this latter especially, as most of our States allow six years from the date of accident in which to enter suit to recover damages, — the advice and knowledge of a broker as to all these points is of great value to the insurer, and results in his procuring a contract at a fair price in a reliable company which covers absolutely every feature of liability that can possibly arise on account of personal injury to employees or public resulting from his business operations. I am, dear sir,

Yours respectfully,

JOHN C. PAIGE.

STRENGTH OF MORTAR.

THAT the common belief among builders that it is better practice to mix lime mortar and let it lay in a heap some days previous to use is well founded has been proven by recent experiments made in England. In the tests, samples of mortar were taken, on successive days, from two separate heaps of large size, briquettes were made therefrom, and, after an interval of some weeks, were broken for estimation of tensile strength. The brick fifty days old, which was made from mortar that had been in the heap three days, showed an average breaking weight of 34.6 pounds; while a brick forty-five days old, made from mortar which had been in the heap after mixing seven days, required 41.5 pounds' strain. — *Building Trades Journal.*

HOW TO PREPARE MORTAR.

ENGINEERING, N. Y., March 16, contains a letter from Mr. Edward Wolff, which, in view of recent occurrences in New York, is of interest as showing defective methods of mortar making employed by builders, and as giving the proper method of slacking lime, preserving it in good condition after slacking, and preparing from it strong, adhesive mortar: —

"The slacking operation should be done in a water-tight box made of boards, and so much water should be mixed in that the contents will never get dry, and a sheet of water will remain on top to prevent access of air. If the box will not hold the entire quantity of lime required, the contents may be emptied into a cavity made in the ground close to the pan, and this process may be repeated. This should be done at least two weeks before sand is added, or before the mortar is prepared for use. Slacked lime prepared and kept as stated has been found free of carbonic acid after many years, air and gas having not been able to find access. Instead of following the procedure in slacking lime recommended above, we see in this country, or at least in the neighborhood of New York, a faulty process adopted, which consists in loosely mixing the sand with the slacking lime immediately after water has been added, and forming a dry heap on the surface of the ground, which is left lying there several weeks to give time for complete slacking before the sand is worked in evenly and the mortar considered ready for use. This heap arrangement is perfectly adapted to circulating air through a material which should be guarded against contact with air. The sun heats the surface of it, makes the air escape after it has given up its share of carbonic acid gas, while at the base of the heap and at the shady side a fresh supply enters to fill up the vacuum after it has circulated through the heap and has been robbed of its share of carbonic acid gas. That this procedure really happens in such a heap we can easily see when we place a lump of freshly slacked lime in a wineglass, and in another glass place a small quantity of material taken from a heap such as described, and which has been prepared a few days before; fill both glasses nearly up with water, and add a few drops of muriatic or sulphuric acid to each. In the first glass nothing can be observed, while in the second glass we will see in the shape of small bubbles the carbonic acid escape, which has been absorbed by the lime from the atmospheric air circulating in the heap." It is reasoned that, as the hardening of mortar after mason work results from slow absorption of carbonic acid from the air, if this be allowed to take place to any considerable extent before the mortar is used, a granular and non-adhesive condition of the mortar results, and a strong wall cannot be made with it.

MOVING BRICK HOUSES.

THE moving of immense brick structures is no longer an experiment, for this branch of the building trades has taken its place as one of the exact sciences, says a writer in *The Western Builder*. It is no longer necessary to tear down a valuable structure in order that the ground may be used for a more expensive building or to make a thoroughfare. In these modern days a large and heavy brick or stone house can be moved with the ease with which a piece of furniture on rollers is moved. The old method of tearing down and carting the *débris* to a second-hand dealer was wasteful of good material, but by the new method a house is removed quickly and without disturbing any of its contents. It is not even necessary to stop business operations in the building while the work is in progress.

The method by which these removals are accomplished is a most interesting one. Large timbers are placed three feet apart under the first floor joists and running through the building. Under these are placed a second row of timbers at right angles to the first, and under these last timbers strong lifting jacks are placed about one foot apart. The building is then lifted off the foundation to a proper height to move it. The ground over which the building is to be moved is made perfectly level and covered with boards, on which tracks of heavy timbers are then laid. Maple rollers five feet long are slipped under the timbers in the house, and the moving process is ready to begin.

If the house is a small one it is slipped over greased planks, and rollers are not needed. This method is also employed when the distance to be moved is small. In long moves and heavy houses where rollers are used, the motive power is furnished by a single horse pulling on heavy chains and pulleys so arranged that the greatest amount of power may be had at the least expenditure of force. The new foundation is built up between the timbers, or needles as they are sometimes called. After the foundation walls are built and have dried, the timbers are drawn out one by one and the holes are filled in. The new foundations are always much stronger than the old, because the weight of the house comes on them at once, and they must of necessity be built strong.

EDITOR OF THE BRICKBUILDER:

Dear Sir, — Your "Side Talks with the Builders," in the April BRICKBUILDER, was timely and to the point, and that portion advising young and inexperienced workmen not to be in a hurry to take contract work in the spring was in order and to the point.

Here in this northern country — Canada — the winters are long and severe, and bricklayers and masons have necessarily a long spell of idleness, and of course when spring does set in they are anxious to go to work at the earliest moment possible, and in their anxiety frequently contract for work much below its actual value. A case in point has just come under the writer's notice, one of a great number, and was as follows: A strong company in town desired to erect a large brick building for a sort of annex to their extensive meat-curing factory. Plans and specifications were prepared during the winter, and the contracts were advertised to be let about May 1. Nearly all the legitimate contractors tendered for the work, and a bricklayer who had never had any experience with large contracts tendered also. His figures were so low that the company, who thought the regular contractors wanted to swindle them, gave him the work. Everybody knew, who knew anything about such work, that if the successful tenderer went on with the work it would ruin him. He commenced operations, however, engaged his men, and purchased some of his material, when all at once it dawned upon him that he had taken the work too low. Fortunately the papers had not been completed, and he threw the job up. The company tried to keep him to his bargain, and at last offered him a big sum more if he would go on with the work. He concluded to try it again, did so, this time under the knowledge that he was tied down on paper to complete the work. He discovered the other day that even with the additional sum allowed him he would lose money, so abandoned the work a second time. The company was obliged to have the work done, so were compelled to fall back on the regular contractors, who now command the situation, and the owners have to pay the piper. The first contractor has now got into trouble that may sweep away a lot of money, and he has missed several smaller jobs that were within his capacity as a contractor.

This is one of many like cases that I have met with in my forty years' experience. Men are too anxious to become contractors, and fail to recognize the fact that special qualities are required in a man to make a successful contractor.

FRED. T. HODGSON.

THE American Hoist & Derrick Company, headquarters St. Paul, Minn., have just opened an Eastern office in the Havermeyer Building, New York City, under the management of Mr. W. L. Manson. This is done for the better accommodation of their Eastern trade.

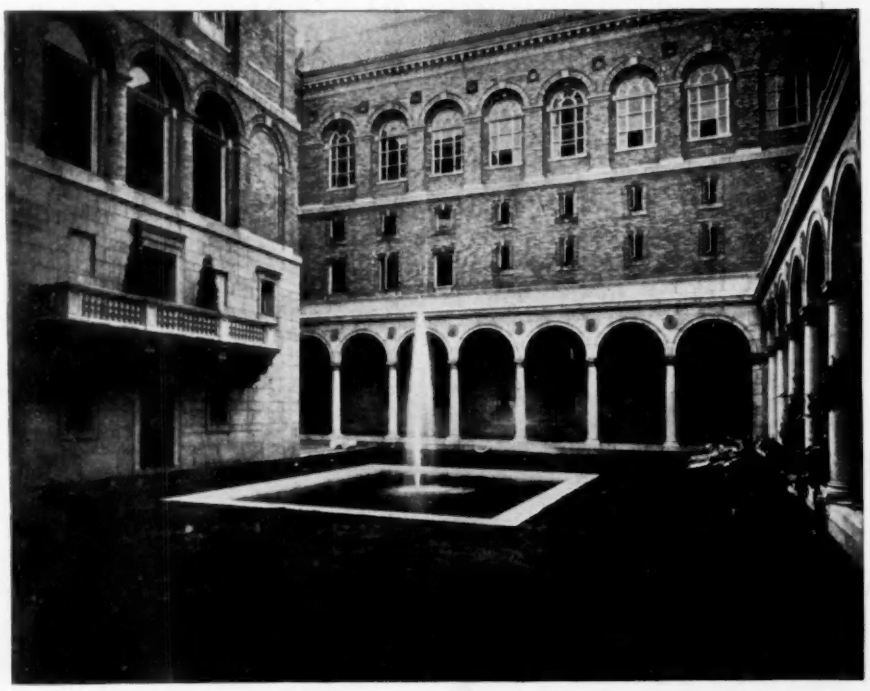
WE have just received a catalogue from J. B. Prescott & Son, Webster, Mass., setting forth the numerous advantages to be received from the use of the Morse patent steel wall ties. This catalogue has a number of very good suggestions upon bonding hollow walls, pressed brick facing, granite facing, also methods of fastening brick veneer by means of their wall tie. Parties interested should certainly send for a copy of this catalogue.

Recent Brick and Terra-Cotta Work in American Cities.

A Department Devoted to the Interests of the Manufacturer.

CHICAGO. — News of some interest to Chicago architects and builders hinged upon the late city election. A change was made from a Democratic to a Republican administration by a majority of forty thousand. Whether the change was from one corrupt administration to another corrupt governing body remains to be seen. But it is very significant that "civil service" was adopted by a vote of nearly two to one. This municipal field is certainly ripe for reform. The city council is notoriously corrupt, and at least one department of the city government, that of building inspection, has become almost a farce.

One incident indicates the degree of efficiency which the building inspection department seems to possess in insuring safe construction. Some heavy loads and doubtful construction were under discussion when the coming of a veteran building inspector (who has been on the force fifteen years he said) was welcomed and his advice was asked, "What do you consider a safe load to allow per square foot on a brick pier of that character?" indicating a heavy pier of common brickwork. The inspector coughed and looked wise and said gravely, "Oh, let me see, — about nine hundred pounds, — yes, I think it ought to carry nine hundred." To those who calculated twenty times that load on the pier in question, the inspector's estimate would seem to be on the safe side certainly. The official, however, knew so much about his business that if any one had said ninety thousand pounds, he would have nodded like a judge and guessed that was all right.



BOSTON PUBLIC LIBRARY. COURTYARD AND FOUNTAIN.
MOTTLED BRICK AND TERRA-COTTA MADE BY THE PERTH AMBOY TERRA-COTTA COMPANY.

Not only are inspectors and other officials ignorant, but flagrant violations of the ordinances have been allowed for a price. One could build a show window a foot or so out on the narrow sidewalk of a narrow congested street in the heart of the city, or build a wall four inches thinner than it ought to be, simply by slipping twenty-five dollars or one hundred dollars into the right place.

Mayor Swift seems rightly determined in civil service intentions. The new commissioner of public works, W. D. Kent, is attracting much attention by his weeding process among city employees, and he has an opportunity to win the lasting favor of Chicago.

One of the best known contractors in the city, Joseph Downey, who, with Mr. D. Adler, the architect, was a member of the committee who draughted the revised building ordinances, has been induced to become the building commissioner, and it is to be hoped that he will feel a double responsibility in seeing the ordinances strictly enforced. At present the dictum of the Board of Underwriters is the only law that seems to command any respect from builders.

May of course is in the busy building season, and while there seems to be a healthy growth in business, yet it is largely true, as one architect remarked, "We haven't a single important building in our office; they are all 'chicken feed.'" The large office buildings which THE BRICKBUILDER intends to illustrate next month will not have many followers to keep them company in the immediate future. Chicago is so well supplied with office space that owners have been known to assume new leases for tenants in old buildings, to induce them to move into the new skyscrapers, where they pay the same or even less rental. In other words, owners are taking the risk of carrying tenants rent free in order to fill the new buildings.

The apartment building business also, in some regions, notably that of the World's Fair site, seems to be somewhat overdone. Experienced investors are requiring gilt-edged security for loans on apartment buildings, or even advising borrowers not to build at all. But Chicago's constant growth will very quickly make the demand as great as the supply of both office and apartment buildings.

There are only three office buildings in prospect, one of these being still in the uncertain stage, and of the other two which are to begin erection soon, the Atwood, corner Clark and Madison, will be carried at present, so it is reported, but a part of its ultimate height.

The temporary Post Office and Government Building, to be erected on the Lake front, is supposed to be nearly ready for letting contracts. The exterior, it is said, will be largely terra-cotta. This building is to be occupied during the construction of the new $4,000,000 Government Building, which will stand on the site of the present notoriously dark and dangerous structure.

Some of the lately finished buildings — the immense Marquette, the Music Building with its Steinway Hall and music studios, and the Rothschild, another addition to the list of big department stores, the new Science building, the Yerkes Observatory, the elaborate new Smallpox Hospital and others, including some new residences — will be spoken of in detail later.

PHILADELPHIA. — The last month has seen some of the largest and most extensive improvements in building. The Horticultural Hall, a description of which was given in your columns some months ago, has been contracted for, and the actual work has been commenced, and is being pushed vigorously; it will give to this city one of the finest buildings of its class in the country, it not being merely a beautiful shell upon the exterior of which all the ornament has been lavished, and nearly all the money spent; on the contrary, the interior

of this building receives its full share of the study, treatment, and expenditure; is in perfect harmony with the exterior, and makes the whole a thoroughly consistent and harmonious production; the exterior is of brick and terra-cotta, with an especially rich frieze which will be treated in color; the ornament is rich and bold, and considerable skill has been shown in the placing of it just where it will count for the most in the design, without overloading the façade, as has recently been done in some of the latter terra-cotta buildings.

Within a few hundred feet from the Horticultural Hall are at present being laid the foundations for the new Metropole Hotel, which will be a steel frame building with walls of brick, stone, and terra-cotta; it will be large and imposing, and the contractors wish to make a record for speed in the construction of the work, and consequently are at it day and night. Rumors are afloat to the effect that it is to be in condition for business before the first of the next year.

The large Dormitory Building, or rather series of buildings, which will be erected during the summer for the University of Pennsylvania will soon be ready for the bidders. The present scheme for the buildings shows probably the most extensive system of dormitory buildings ever attempted as a whole by any institution of a similar kind; about half of the entire scheme will be built this summer, and the remaining parts are all expected to follow at once. They are of brick and stone, in the style of the English Renaissance, very elaborately ornamented, and will be strictly fireproof throughout. The composition and grouping of the different parts of the scheme are excellent; the Dining Hall, Administration Building, Chapel, etc., being placed in prominent positions, which add very materially to the composition as a whole. By studying the design, one is impressed with the manner by which the architects have avoided the least appearance of the painful monotony which is so frequently seen in large operations, while at the same time, by a certain amount of repetition, they have added very materially to the strength of the composition. It might be well for some builders, and, for that matter, also architects, who plan and erect entire blocks of residences at one operation, to study seriously the grouping and especially the planning of these buildings.

RESIDENCE OF EDMUND HAYES, ESQ., BUFFALO, NEW YORK.

GREEN & WICKS, ARCHITECTS.

The Mottled Fire-Flashed Pompeian Terra-Cotta which was used with fine effect in this Building was furnished by Fiske, Homes & Co.

The opening of the new Mercantile Club Building, which occurred several weeks ago, has had its effect upon the minds of the public. It will undoubtedly advance the methods of brick and terra-cotta construction as set forth in the façade of the building, and must be far reaching in its effect, since the club is made up of many of the best and most prosperous merchants of the city. The building was kept open to the public for an entire week; everybody interested in any manner in building, who was able to obtain the necessary passes, went to see it; all came away pleased, and much of the prejudice against terra-cotta as a building material must have been removed. The building is spacious and elegant, and exhibits an unusually large and imposing façade, executed in buff brick and terra-cotta.

ROCHESTER. — If the work being done in architects' offices is an indication of better times, there must be a very marked improvement here this month over last. Nearly all the offices are "busy just at present"; and although an architect of long experience has said that this season would keep architects rushing, trying to find enough work to pay office expenses, other architects seem to think differently.

There is a great deal of competition going on lately. The theatre at Charlotte, which will cost about twenty thousand dollars, was won by Mr. George T. Otis; and it is said that the Normal School at Geneseo, which was expected to go to Mr. Foote of this city, has been given to a Mr. Longfellow of Boston. The Union School at Wolcott is about to be awarded to some one, as a meeting at which plans were to be submitted was held Saturday, May 4. Several designs will be submitted from this city.

Work on the new Court House has been started again, and is being rapidly pushed forward.

In all probability there will be no strikes by the labor unions this spring, as about half of their members are so busy *striking* contractors for jobs, that they will have no time to attend to any other kind of strike, and it is even being said that "walking delegates," much as they dislike work, are looking for something to do.

Work now on in the offices, about to be let, or which has just been let, is as follows: Contracts have just been signed for block for Mr. Philip Christman, Lyell Avenue, by Kay Brothers and George B. Garrison; pressed brick furnished by New York Hydraulic Pressed Brick Company; architect, George T. Otis. House of Mr. Thomas Levis, New York hydraulic pressed brick, cost fifteen thousand dollars; architects, Kelly & Headley.

Kelly & Headley have also let contract for brick block on North Clinton Street to Dominick Kraft, and have plans of church for "Holy Apostles" Congregation; stone and brick; estimated cost, $40,000.

George F. Hutchison, architect, has let contract for Town Hall at Caledonia to R. G. Porter of Buffalo, and is preparing plans for residence for Mr. Emmett Craig. New York hydraulic pressed brick will be used for both of these buildings.

Messrs. Fay & Dryer, architects, are making plans for an apartment house to be built for the Proctor estate; there are to be three stories, all the improvements, including a pressed brick front, furnished by the ever-reliable New York Hydraulic Pressed Brick Company.

The First Methodist Congregation have decided to erect a new church; and Rev. M. R. Webster, A. L. Thompson, and Geo. B. Watkins have been appointed a committee to secure plans. A large and costly edifice is contemplated.

Gordon & Bragdon, architects, have dissolved partnership. Mr. Bragdon will travel abroad.

DETROIT. — After a long siege of idleness for the contractor, spring has opened with most encouraging results in the building line, in fact to such an extent that the journeymen have demanded union wages, with prospects of a strike in case of refusal; this leaves the contractor uncertain how to figure with a number of large contracts about to be let, one of which is Mabeley & Company fourteen-story building, to be erected on the most valuable piece of property in Detroit, and also two steel fireproof pressed brick buildings, the larger, the Union Trust Building, being ten stories in height, and the Masonic Temple, which has more, as well as the most elaborate terra-cotta detail than anything ever attempted in this city.

BRICK MANTELS AND FIREPLACES.

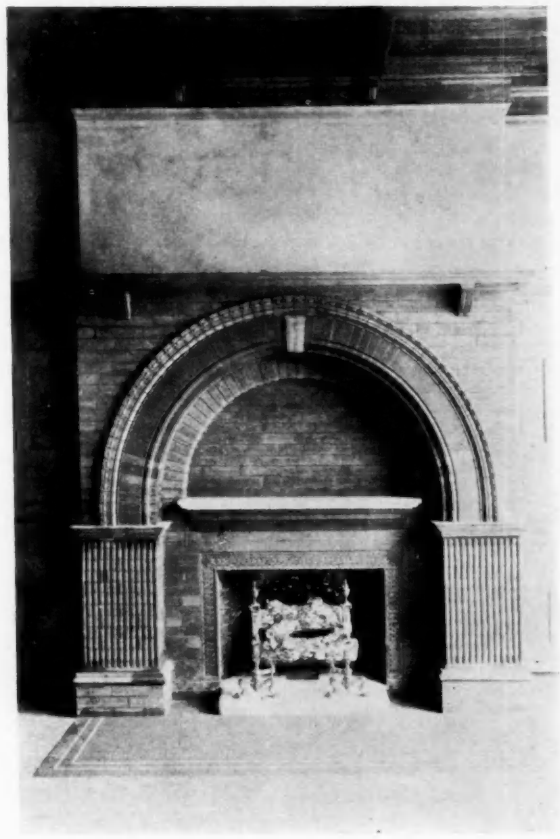
NOW that hot-air furnaces and radiators have, in some degree, been relegated to their properly subordinate position, and wood fires have been rekindled on our hearths, it is pleasant to glance at and consider the increased number and richness of materials available in the building of the centre of the home — the fireplace. We publish herewith several illustrations of fireplaces, mantels, and chimney-pieces, the materials of which are almost wholly brick and terra-cotta, as made by The Central Press Brick Company, Cleveland, O.

Since "practicable" fireplaces have come back into favor, and are demanded in the smallest and largest homes, the owner and architect are no longer confined to the use of the plain regulation size, red brick. Not only have bricks been made in many sizes, but the forms and colors have been endlessly varied, so to-day it is possible to select bricks of the proper scale to fit a small private room, or a room large enough to be adapted to public uses.

The color scheme of a fireplace can now be made to harmonize with the coloring of the room either by adopting one color for all the brick used, or by selecting several shades of the same color or different colors, and getting the desired effect by lines, panels, or diapering. So many colors and shades of bricks are produced that no harshness or crudeness need result from the introduction of more than one

color in the same piece of brickwork. Red, black, yellow, gray, and white brick and beautifully delicate colors and shades of the same, produced by varying mixtures of two or more colored clays, add to the richness of the storehouse to be drawn from.

The forms of bricks are now only limited by the inventive powers and the taste of the designer. Ordinary straight brick are thin or thick, short or long, wide or narrow, as needed for any case. Then too the bricks are curved on the face, moulded, decorated with dentil,

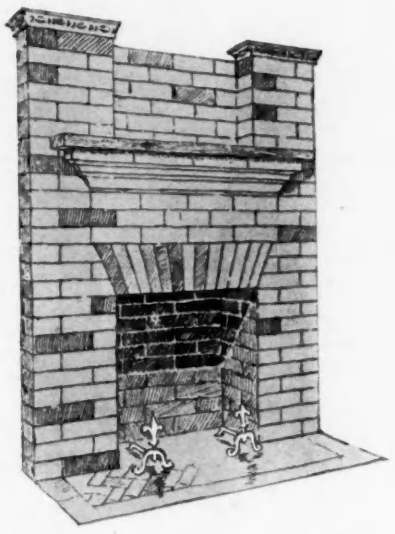


dogtooth, egg and dart, or other appropriate form, or may have the surface covered with delicate arabesques. With this variety it is possible to build fireplaces and mantels suited to modest domestic work or to rooms having a monumental effect.

Brick, and particularly that made wholly or in part of fire clay, is a material peculiarly adapted to fireplace work, having in its manufacture passed through and proved itself capable of resisting fire; while marble, iron, and stone too often succumb to a moderate degree of heat. Iron twists if wrought, cracks if cast; stone splits or chips; marble turns to lime, or the wax with which its imperfections are concealed slowly fires out and leaves the once beautiful surface pitted as with smallpox. Brick endures longer than any material used in fireplaces.

The architect when called upon to construct a fireplace of brick will consider the material and its limitations in form and dimensions. If the material is to be brick, the parts will necessarily be small, and the designer will be led naturally to adopt some form of arch for covering the fireplace opening, as the arch is the proper constructive form, requiring no concealed aid for its support. If a plain row of stretchers is placed over the opening of a fireplace, it must be supported by iron in some form, generally a flat wrought bar. This construction is far from satisfying to the eye, as the bar is generally concealed, and the law of gravitation seems to have been defied; but the outraged law has its revenge the first time that a somewhat hotter than usual fire is kindled, for then the iron bar expands as heated, and contracts as the fire goes out, having in the mean time moved the bricks above, causing disfiguring and permanent cracks and dislocations. With the arched form of fireplace no such unhappy result need ensue; the brick having during its birth passed

through a fiery furnace is now affected so little by extremes of temperature that once solidly placed on a good foundation, a brick fire-



place and mantel should remain perfect as long as the building endures in which it stands.

REMARKABLE ACTIVITY IN BUILDING.

TWICE AS MANY NEW BRICK BUILDINGS AS A YEAR AGO.

A COMPARISON of the permits for new buildings granted this year with those of a year ago and preceding years shows a sensational increase in building this year over 1894, and more of it than any of the past five years, excepting 1892, which is nearly equalled.

The following table, compiled for this column, shows the new structures for the first four months of this year and a year ago: —

	Brick.	Wood.	Total.
1895	86	279	365
1894	13	142	155
Increase	73	137	210

It will be noted that the brick buildings number between seven and eight times as many as last year, and that the frame structures have nearly doubled, the total increase being 210, against a total number last year of 155. This is truly a remarkable exhibit, and proves the great activity in building in Boston.

The following table will show at a glance the permits for new work during the first four months of the last five years: —

	Brick.	Wood.	Total.
1895	180	569	749
1894	91	458	549
1893	150	502	652
1892	91	665	756
1891	99	438	537

This year leads last by just 200, and the brick buildings are very nearly double in number. In this class of construction this year is far ahead of any of the others; in frame it falls behind only 1892.

The number of brick buildings completed during the months of February, March, and April was 76, costing $1,265,607, against 22, costing $478,640, a year ago. The frame buildings completed numbered 305, costing $1,614,085, compared with 153, costing $530,175, for the corresponding period of 1894. — *Boston Herald*, May 2.

THE EAST AHEAD THIS YEAR.

A CHICAGO builder, who keeps run of construction in different parts of the country, thus sums up the operations in the principal cities in an interview in the Chicago *Times-Herald*: —

"The indications, as I have watched them during the first four months of 1895, show that those cities with the greatest percentage of 'home' capital are doing the greatest amount of building this year. The cities which head the list are New York, Philadelphia, and Boston, in the order named. Of the cities in the central West, perhaps Detroit is doing as well as any, and favorable reports come from Buffalo and New Orleans.

"As I remarked recently, this is not a year for the young giants of the Mississippi Valley. The year 1895 will pass into the history of building operations as an 'Eastern year.' Such cities as St. Paul, Kansas City, Minneapolis, Denver, Omaha, and Duluth are likely to jog along quietly this year. As a Minneapolis man remarked the other day, 'We are taking a little rest out our way this year, waiting for the Eastern cities to catch up.' Yet many cities of the central West are doing fairly well this season, and building operations will never come to a standstill in Chicago, or St. Louis, or Milwaukee, or Cleveland.

"Another important characteristic of the season is the advance in the price of iron. The Carnegie people and other concerns in Pennsylvania and other States have voluntarily advanced the wage scale, and building bricks and other largely used material staples have sustained an advance in price. It therefore costs more money to build in 1895 than it did in 1894, but there is more money afloat to pay for it than during 1894 or 1893. The bull movement is on."

MEASURING BRICKWORK. — Ordinary bricks are about eight inches in length, and, with a mortar joint, about half that in width, so that each brick on the flat will give a horizontal surface of about thirty-two square inches, or four and a half bricks will cover one

square foot. As ordinarily laid, there are nine courses to every twenty-four inches, or four and a half to the foot; four and a half courses, with four and a half bricks to the course, will give twenty and one fourth bricks to the cubic foot. Waste, cutting, and close joints will easily require an allowance of twenty-one bricks per cubic foot, which will be found a very convenient figure for estimating the number of brick required for a wall of given height and thickness, as it thus becomes unnecessary to find the cubic contents of the wall, but merely to multiply its face area, or the product of its length and height in feet, by seven fourths of its thickness in inches, which, as the thickness is always some multiple of four inches, is a very simple process. — *Boston Journal of Commerce*.

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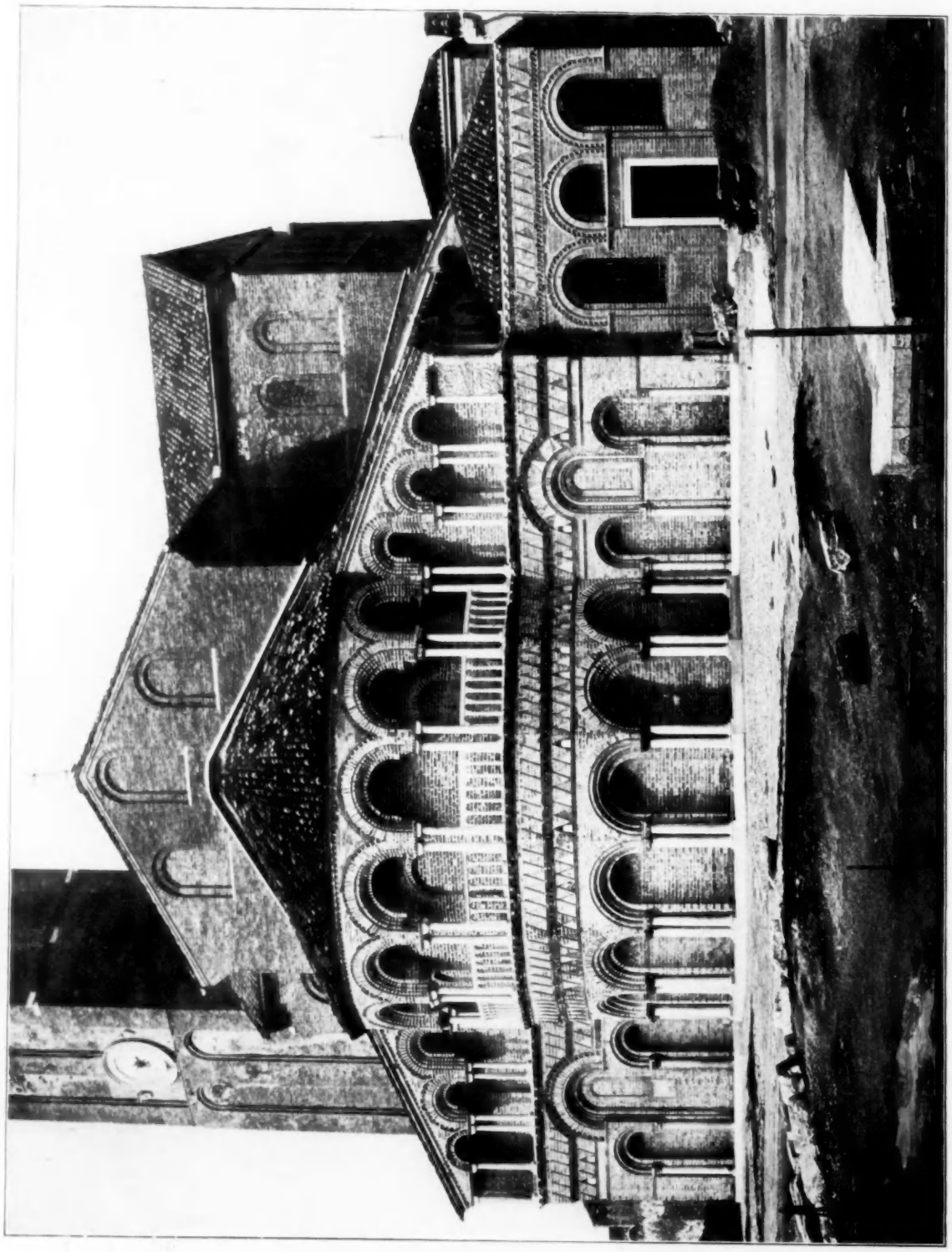
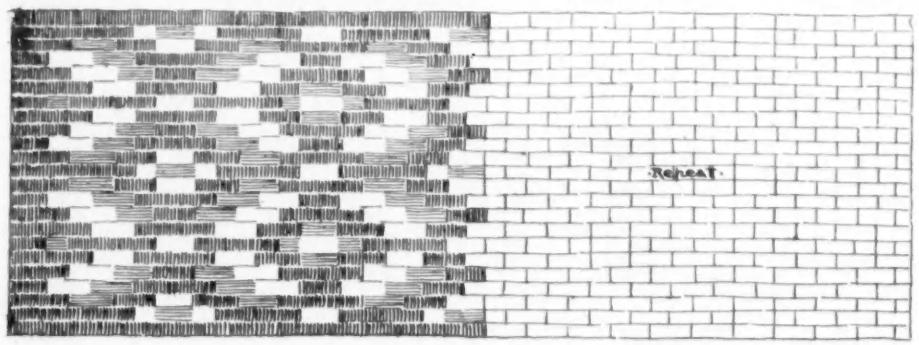
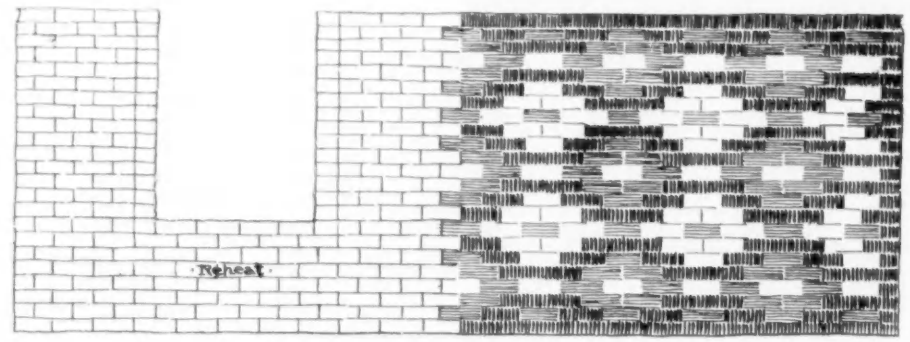


THE ASPE OF THE CHURCH OF SAN DONATO, AT MURANO.
SUPPLEMENTARY ILLUSTRATION TO "BRICK AND MARBLE IN THE MIDDLE AGES."



West Elevation



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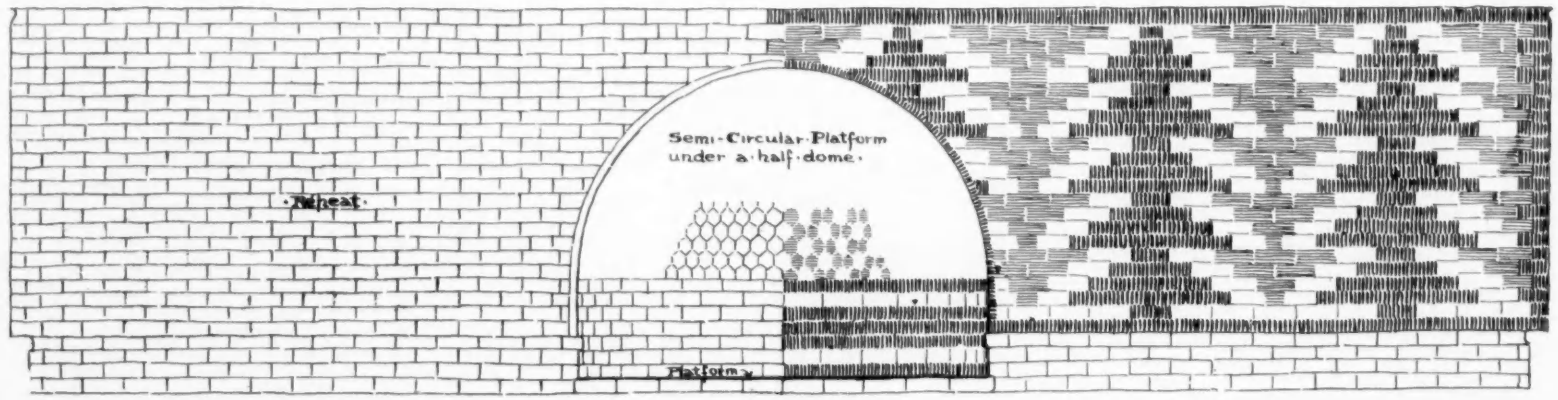
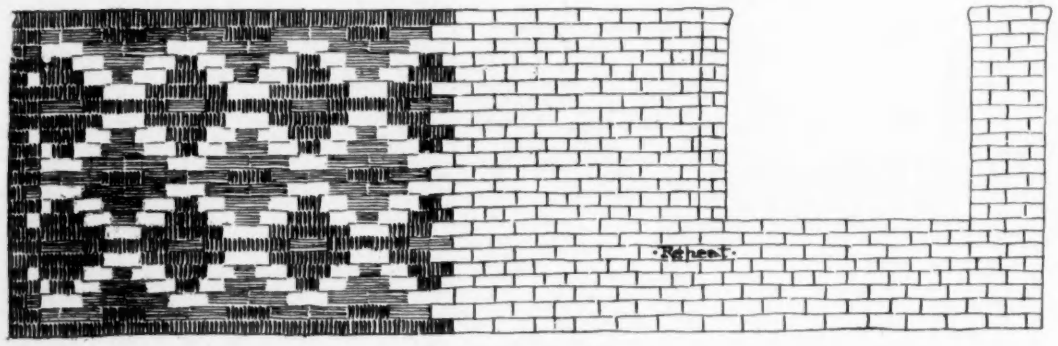


North Elevation

Scale of Feet 5 10 15

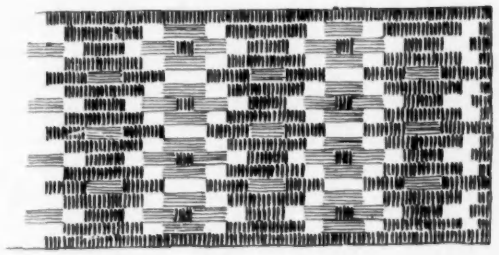
DESIGNS FOR GLAZED TILE WAINSCOTS ON WALLS OF PLUNGE BATH AT "CHATWOLD" BAR HARBOR MAINE

Andrews Jaques and Rantoul Architects Boston



South Elevation

COLOR KEY
Green =
Yellow =
White =
Tiles = 4" x 12"



For Lounging Room

HOUSE FOR LOUIS CABOT,
STURGIS & CABO

UIS CABOT, ESQ., BROOKLINE, MASS.

STURGIS & CABOT, Architects.

SCALE

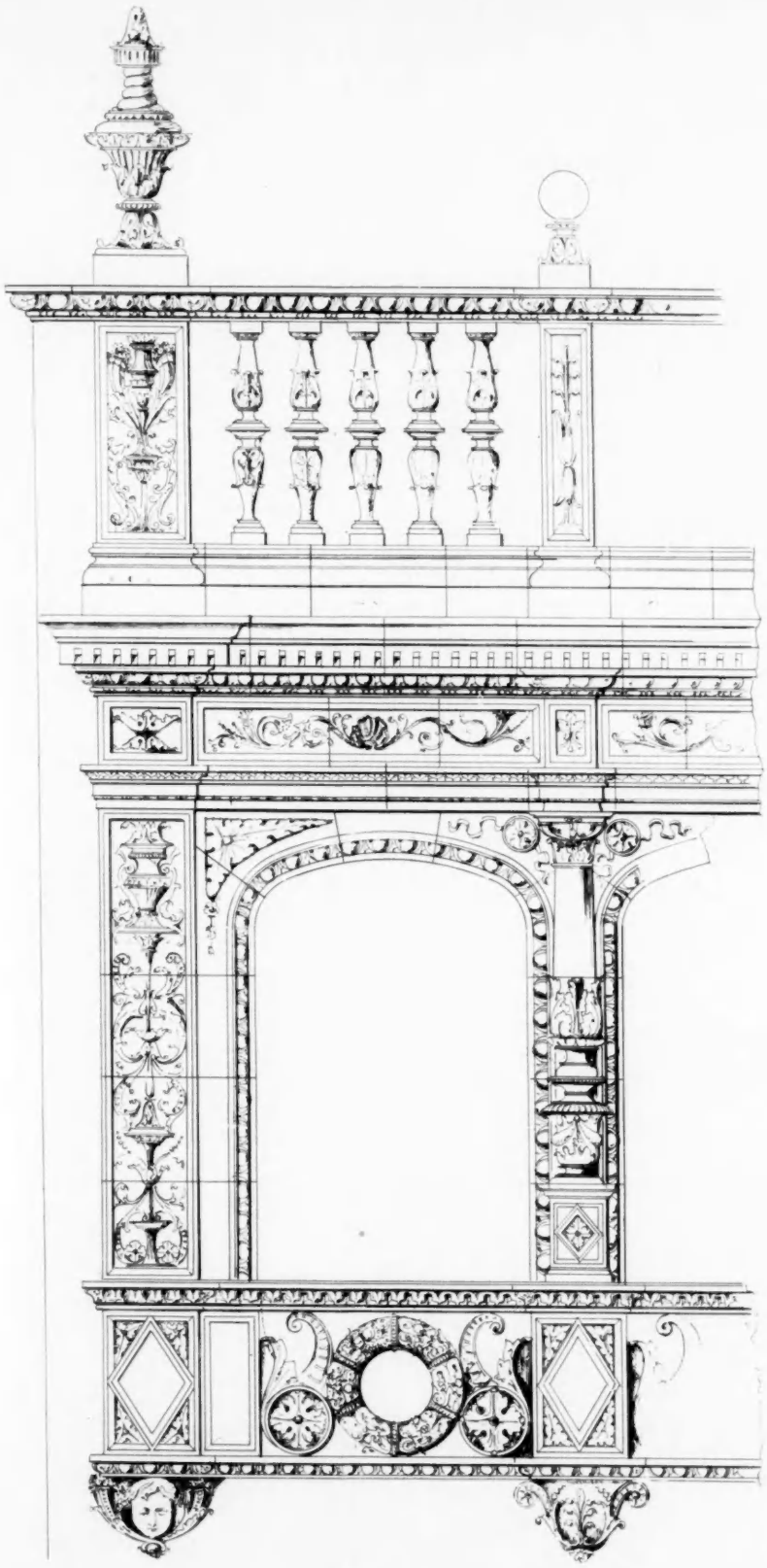


FIG. 3.

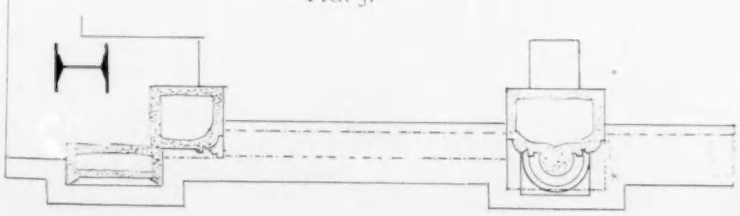
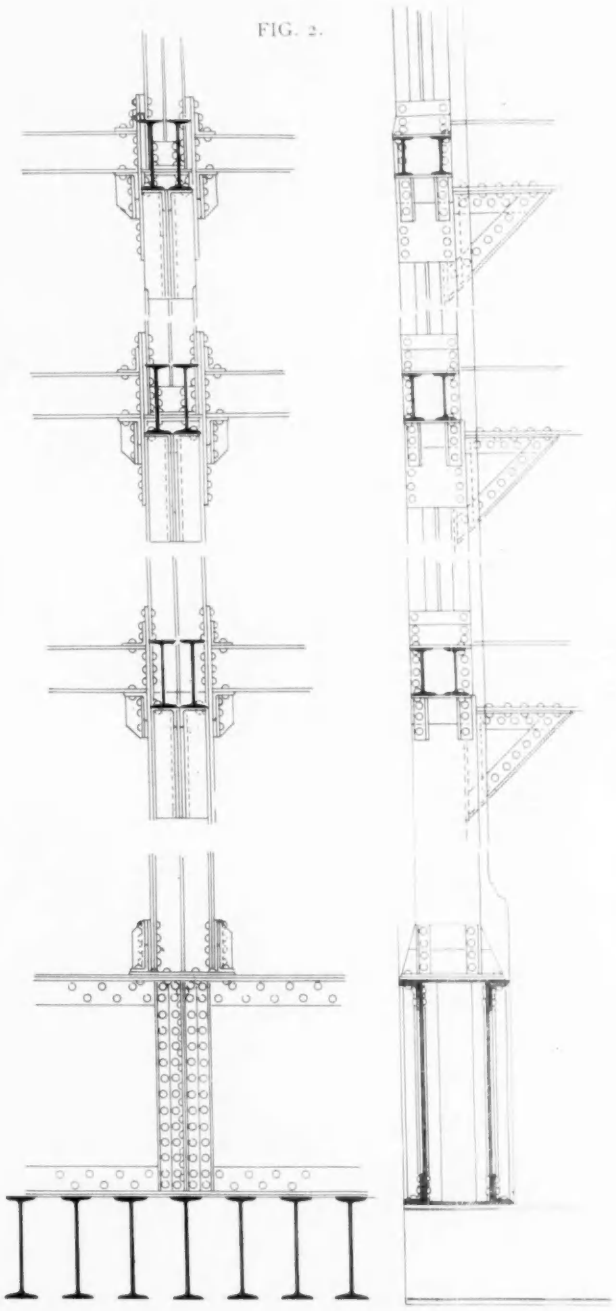


FIG. 2.



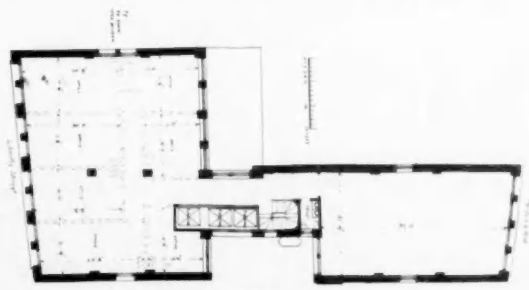


FIG. 1.

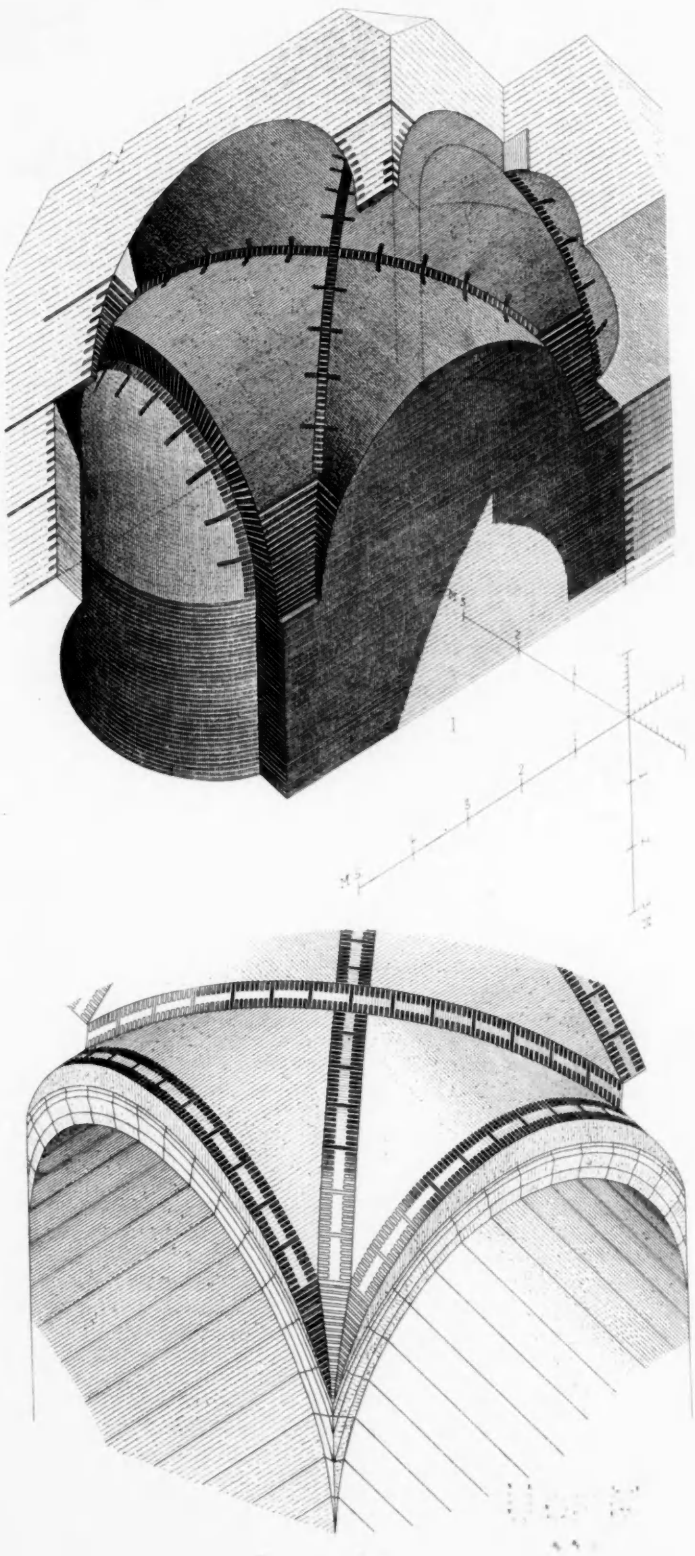


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PLATE VII. THE ART OF BUILDING AMONG THE ROMANS.